CITY OF VACAVILLE - UTILITIES DEPARTMENT
PUBLIC WATER SYSTEM 48-10008

2013 TRIENNIAL REPORT ON WATER QUALITY RELATIVE TO PUBLIC HEALTH GOALS

Background Information

Provisions of the California Health and Safety Code (Reference No. 1) specify that water systems serving more than 10,000 prepare a special report by July 1, 2013 if their water quality measurements have exceeded any one or more of 105 Public Health Goals (PHGs). PHGs are non-enforceable goals established by the California Environmental Protection Agency (Cal-EPA) Office of Environmental Health Hazard Assessment (OEHHA). The law also requires that where OEHHA has not adopted a PHG for a constituent, the water supplier is to use the United States Environmental Protection Agency (USEPA) Maximum Contaminant Level Goal (MCLG) for the constituent. Only constituents which have a California primary drinking water standard and for which either a PHG or MCLG has been set are to be addressed. (Reference No. 2 is a list of all regulated constituents with the MCLs and PHGs or MCLGs.)

There are a few constituents that are routinely detected in water systems at levels usually well below the drinking water standards for which no PHG or MCLG has yet been adopted by OEHHA or USEPA including Total Trihalomethanes. These will be addressed in a future required report after a PHG has been adopted.

The law specifies what information is to be provided in the report. (See Reference No. 1)

If a constituent was detected in the City's water supply between 2010 and 2012 at a level exceeding an applicable PHG or MCLG, this report provides the information required by the law. Included is the numerical public health risk associated with the constituent's Maximum Contaminant Level (MCL, the highest level allowed in drinking water) and the PHG or MCLG, the category or type of risk to health that could be associated with each constituent, the best treatment technology available that could be used to reduce the constituent level, and an estimate of the cost to install that treatment if it is appropriate and feasible.

What Are PHGs?

PHGs are set by the California Office of Environmental Health Hazard Assessment (OEHHA) based solely on public health risk considerations. None of the practical risk-management factors that are considered by the USEPA or the California Department of Public Health (CDPH) in setting drinking water standards Maximum Contaminant Levels (MCLs) are considered in setting the PHGs. These factors include analytical detection capability, treatment technology available, benefits and costs. The PHGs are not enforceable and are not required to be met by any public water system. MCLGs are the federal equivalent to PHGs.

Water Quality Data Considered:

All of the water quality data collected by our water system between 2010 and 2012 for purposes of determining compliance with drinking water standards was considered. This data was summarized in our 2010, 2011, and 2012 Annual Water Quality Reports, which were mailed or made available to all of our customers before July 1st of each year following the monitoring year. (Reference No. 3)

Guidelines Followed:

The Association of California Water Agencies (ACWA) formed a workgroup, which prepared guidelines for water providers to use in preparing these required reports. The ACWA guidelines were used in the preparation of our report. No guidance was available from state regulatory agencies. (Reference No. 4)

Best Available Treatment Technology and Cost Estimates:

Both the USEPA and CDPH adopt what are known as BATs or Best Available Technologies which are the best known methods of reducing contaminant levels to the MCL. Costs can be estimated for such technologies. However, since many PHGs and all MCLGs are set much lower than the MCL, it is not always possible or feasible to determine what treatment is needed to further reduce a constituent downward to or near the PHG or MCLG, many of which are set at zero. Estimating the costs to reduce a constituent to zero is difficult, if not impossible because it is not possible to verify by analytical means that the level has been lowered to zero. In some cases, installing treatment to try and further reduce very low levels of one constituent may have adverse effects on other aspects of water quality. (Reference No. 5)

Constituents Detected That Exceed a PHG or a MCLG:

The following is a discussion of seven constituents; coliform bacteria, Lead, Arsenic, Nickel, Bromate, Gross Beta Activity, and Uranium that were detected in one or more of our drinking water sources at levels above the PHG, or if no PHG, above the MCLG. (Reference 6 is a tabled summary).

Coliforms

The Maximum Contaminant Level (MCL) in drinking water for coliform bacteria (Coliforms) is 5% positive samples of all samples per month, and the MCLG is zero. Coliforms are indicator organisms that are ubiquitous in nature and are not generally considered harmful. They are used because of the ease in monitoring and analysis. If a positive sample is found, it indicates a potential problem that needs to be investigated and further follow up sampling is done. It is not at all unusual for a system to have an occasional positive sample. It is difficult, if not impossible, to assure that a system will never get a positive sample. Coliforms found in 5% or more of monthly samples is a warning of potential water distribution system problems.

Level in Drinking Water

During 2010-2012, the city staff collected between 104 and 133 samples monthly throughout our distribution system for Coliforms analyses. Of the 4,056 routine samples collected, three samples were positive for Coliforms; all three samples were negative for Coliforms on the next day, follow-up sampling. The three separate positive samples equate to a monthly maximum of 1.5% positive in 2010 when they occurred. There were no positive samples for Coliforms in all of 2011 and 2012.

Health Risk Information
The drinking water standard for Coliforms serves to minimize the possibility of the water containing pathogens, which are organisms that cause waterborne disease. Because Coliforms are only a surrogate indicator of the potential presence of pathogens, it is not possible to state a specific numerical health risk. While USEPA normally sets MCLGs "at a level where no known or anticipated adverse effects on persons would occur", they indicate that they cannot do so with Coliforms.

Best Available Technology (BAT) and Treatment Costs
The City adds chlorine to all drinking water to assure that the water served is microbiologically safe. The chlorine residual levels are carefully controlled to provide the best health protection without causing the water to have undesirable taste and odor or increasing the disinfection byproduct level. This careful balance of treatment processes is essential to continue supplying our customers with safe drinking water. Other equally important measures that we have implemented include: an effective cross-connection control program, maintenance of a disinfectant residual throughout our water distribution system, an effective monitoring and surveillance program, and maintaining positive pressures in our water distribution system.

The City has already taken all of the steps described by the CDPH as "best available technology" for coliform bacteria in Section 64447, Title 22, California Code of Regulations.

Lead

Although there is no federal or state primary drinking water MCL for Lead, the 90th percentile value of all samples from household taps in the distribution system cannot exceed an Action Level of 15 ppb per USEPA "Lead and Copper Rule" requirements. The PHG for Lead was lowered from 2.0 ppb in 2008 to 0.2 ppb in 2009.

Lead finds its way into drinking water usually by the corrosion of internal household plumbing, and occasionally by the erosion of natural deposits. It can also come from the discharges from industrial manufacturers.

Level in City of Vacaville's Drinking Water
Triennial sampling conducted in 2011 resulted in a 90th percentile value for Lead of 2.5 ppb, with 17 of 32 samples exceeding the 2009 PHG of 0.2 ppb. All but two of our surface and ground source water samples tested between 2010 and 2012 were below the new Lead PHG, indicating that household plumbing is the primary source of Lead in the drinking water.

Health Risk Information
The category of health risk for Lead is damage to the kidneys or nervous system of humans. Children may show slight deficits in attention span and learning abilities. Adults who drink water with elevated Lead levels over many years may develop kidney problems or high blood pressure.

Best Available Technology (BAT) and Treatment Costs
In general, optimizing corrosion control is considered to be the "best available technology" to deal with corrosion issues that may be associated with elevated Lead results from household taps. The City's drinking water is monitored regularly for water quality parameters related to plumbing corrosion, such as the pH, hardness, alkalinity, and electrical conductivity, with results indicating that the water is not corrosive to plumbing.

The City's drinking water is consistently below the Action Level for Lead of 15 ppb, indicating that we have met the "optimized corrosion control" requirements for our system. As such, it is not prudent to initiate additional corrosion control treatment, which would involve the addition of chemicals that could Lead to other water quality problems. Therefore, no estimate of cost is included in this report.

Arsenic

Effective in January 2006, the federal Arsenic MCL was lowered from 50 ppb to 10 ppb. CDPH set the PHG for Arsenic at 0.004 ppb in April 2004. This is far below the Detection Limit for Reporting (DLR) of 2 ppb, and is well below the level that can be reliably determined by current laboratory methods.

Arsenic is a naturally occurring element found in many types of rocks and soils. It is also sometimes found in runoff from orchards, and is sometimes found in glass and electronics production wastes. Erosion of natural deposits is the primary source of Arsenic found in the water supply.

Level in City of Vacaville's Drinking Water
For the 2010 to 2012 period, the range of Arsenic detected was between <2 ppb to 9.9 ppb, below the current MCL action level of 10 ppb, but above the PHG of 0.004 ppb.

Health Risk Information
The health risk category for Arsenic is "carcinogenicity" or cancer. Some people who drink water that contains Arsenic in excess of the MCL over many years may experience skin damage or circulatory problems, and may have an increased risk of getting cancer. Numerical health risk data on Arsenic has been provided by OEHHA, the state agency responsible for providing that information. (Reference 2)

Best Available Technology (BAT) and Treatment Costs
The "best available technology" for Arsenic removal is dependent on the water chemistry of the source water being treated. While research into new methods for removing Arsenic continues, the current recommendations are:

- Activated alumina
- Ion exchange
- Coagulation and filtration
- Lime softening
- Reverse osmosis

All of the effective BAT methods for Arsenic removal require significant space, are expensive to install and operate, and would produce residual hazardous waste that would require costly disposal.

A valid cost for Arsenic removal is difficult to estimate at this time, as CDPH has not established a final MCL for California, which may be established at a significantly lower level than the federal MCL of 10 ppb.

Assuming that CDPH does not lower the MCL below 10 ppb, then the cost estimate for BAT Arsenic removal would be based on any water source that had Arsenic detected at or above the DLR of 2 ppb. For the 2010 to 2012 time period, seven of the 12 ground water wells and one of the treated surface water sources exceeded the 2 ppb DLR for Arsenic. Therefore, cost estimates would be based on BAT treatment of seven ground water wells and one surface water source.

A cost estimate, based on assumptions stated previously, to install and operate seven individual Arsenic removal systems for seven ground water wells would range from approximately $4,000,000 to $7,000,000 per year, which includes annualized cost of construction plus annual operation and maintenance costs, ($0.67-$1.84 per 1,000 gallons), or reverse osmosis ($1.90 - $3.69 per 1,000 gallons), but does not include waste disposal. For water produced at 2012 levels, the treatment technology choice would depend on the ability of treatment to attain Arsenic levels below the DLR of 2 ppb for each well. Other treatment options were not considered as they require more space than is available at each well site. This translates into an estimated additional annual cost of to $84 to $ 460 per service connection for the life of the treatment system, depending on treatment technology required.

Nickel

CDPH has set the MCL for Nickel at 100 ppb, with a PHG of 12 ppb. At this time there is no federal limit on the amount of Nickel in drinking water, although the USEPA had earlier promulgated an MCL of 100 ppb and an MCLG of 100 ppb for Nickel, which were both remanded in 1995.

Nickel is a naturally occurring element found in many types of rocks and soils. It is also sometimes found in the waste discharge from metal factories. Erosion of natural deposits is the primary source of Nickel found in the water supply.

Level in City of Vacaville's Drinking Water
For the 2010 to 2012 period, the amount of Nickel found in the water supply was <10 ppb in all but one sample, the one sample containing 16 ppb, an amount that is well below the 100 ppb MCL.

Health Risk Information
The health risk category for Nickel is "developmental toxicity", related to increased neonatal deaths. Some people who drink water that contains Nickel in excess of the MCL over many years may experience liver and heart effects. Numerical health risk data on Nickel has been provided by OEHHA, the State agency responsible for providing that information. (Reference 2)

Best Available Technology and Treatment Costs
The "best available technology" for Nickel removal is dependent on the water chemistry of the source water being treated. The current recommendations are:

- Ion exchange
- Reverse osmosis

An estimate to treat the water the City of Vacaville receives through the NBR Treatment Facility (7,000 Acre-Feet/year) would range from $3,500,000 to $8,400,000 for reverse osmosis, which includes annualized cost of construction plus annual operation and maintenance costs, or would range from $1,500,000 to $4,200,000 for ion exchange. These cost estimates do not include waste disposal costs. This translates into an estimated additional annual cost of $63 to $350 per service connection for the life of the treatment system, depending on treatment technology required.

Bromate

CDPH has set the MCL for Bromate at 10 ppb, with a PHG of 0.1 ppb. Bromate is not commonly found in water, but it may be formed as a by product of ozonation disinfection of drinking water. Bromate is also a contaminant that may be introduced from disinfection treatment of water with concentrated hypochlorite.

Level in City of Vacaville's Drinking Water
For the 2010 to 2012 period, the amount of Bromate found in the treated water ranged from undetected up to 4.3 ppb. This is well below the 10 ppb MCL, but does exceed the PHG of 0.1 ppb established in 2009.

Health Risk Information
Some people who drink water containing Bromate in excess of the MCL over many years may have an increased risk of getting cancer.

Best Available Technology (BAT) and Treatment Costs
The "best available technology" for reducing Bromate to below the MCLG is control or elimination of ozone treatment at the Northbay Water Treatment Plant. However, elimination of ozone treatment is undesirable, as the benefits of ozone treatment (improved water taste and improved removal of cryptosporidium and viruses), outweigh the trace amount of Bromate that is detected in the water.

Gross Beta Activity

CDPH has set the MCL for Gross Beta Activity at 50 pico Curie per liter (pCi/L), with a PHG of zero pCi/L. Gross Beta Activity naturally occurs in many types of rocks and soils. It is also sometimes found in the waste discharge from metal factories. Erosion of natural deposits is the primary source of Gross Beta Activity found in the water supply.

Level in City of Vacaville's Drinking Water
For the 2010 to 2012 period, the amount of Gross Beta Activity found in the treated water sample was "not detected" to 5 pCi/L. This is well below the 50 pCi/L MCL, but does exceed the PHG of zero pCi/L.

Health Risk Information
Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer.

Best Available Technology (BAT) and Treatment Costs
Treating water containing naturally occurring radionuclides increases the radionuclide concentrations in the residual streams. The concentration of radionuclides in the waste stream, the type of waste produced (liquid or solid), and federal and state regulations will affect what disposal options are available to the system and what technology can be used for removal of the contaminant. BATs include:

- reverse osmosis
- lime softening
- ion exchange
- point of use reverse osmosis.

A cost estimate to install and operate a treatment system to lower the Gross Beta Activity level in at least 4 ground water wells would range from approximately $125,000 to $806,000 per year, which includes annualized cost of construction plus annual operation and maintenance costs, but does not consider waste disposal costs. This estimate is based on reverse osmosis ($1.90 - $3.69 per 1,000 gallons) or ion exchange ($0.67-$1.84 per 1,000 gallons) technologies for the amount of water produced, choice of which would depend on the ability of treatment to attain a Gross Beta Activity level closest to the PHG of zero. This translates into an additional annual cost of approximately $6 to $35 per service connection for the life of the treatment system, depending on treatment technology required.

Uranium

CDPH has set the MCL for Uranium at 20 pCi/L, with a PHG of 0.43 pCi/L. Erosion of natural deposits is the primary source of Uranium activity found in the water supply.

Level in City of Vacaville's Drinking Water
For the 2010 to 2012 period, the amount of Uranium found in the treated water was from 1.1 - 3.2 pCi/L. This is well below the 20 pCi/L MCL, but does exceed the PHG of 0.43 pCi/L.

Health Risk Information
Some people who drink water containing Uranium in excess of the MCL over many years may have kidney problems or an increased risk of getting cancer.

Best Available Technology (BAT) and Treatment Costs
Treating water containing naturally occurring radionuclides increases the radionuclide concentrations in the residual streams. The concentration of radionuclides in the waste stream, the type of waste produced (liquid or solid), and federal and state regulations will affect what disposal options are available to the system and what technology can be used for removal of the contaminant. BATs include

- reverse osmosis
- lime softening
- ion exchange
- point of use reverse osmosis.

A cost estimate to install and operate treatment systems to lower the Uranium level in each of Vacaville's 11 ground water wells would range from approximately $ 340,000 to $ 2,200,000 per year, which includes annualized cost of construction plus annual operation and maintenance costs, but does not consider waste disposal costs. This estimate is based on reverse osmosis ($1.90 - $3.69 per 1,000 gallons) or ion exchange ($0.67-$1.84 per 1, 000 gallons) technologies for the amount of water produced, choice of which would depend on the ability of treatment to attain a Gross Beta Activity level closest to the PHG of zero. This translates into an additional annual cost of approximately $14 to $92 per service connection for the life of the treatment system, depending on treatment technology required.

RECOMMENDATIONS FOR FUTHER ACTIONS

The drinking water quality of the City of Vacaville meets or exceeds all state and federal drinking water MCL standards set to protect public health. To further reduce the levels of the contaminants identified in this report, which are already significantly below the health-based MCLs, additional costly treatment processes would be required. The effectiveness of the treatment processes to provide any significant reductions in constituent levels at these already low values is uncertain. Furthermore, the health protection benefits of these estimated reductions are not at all clear and may not be quantifiable. Therefore, no action is proposed.

REFERENCES
1 - Excerpt from California Health & Safety Code: Section 116470 (b)
2 - Health Risk Information for Public Health Goal Exceedance Reports
3 - City of Vacaville 2010, 2011 and 2012 Drinking Water Quality Reports
4 - Suggested Guidelines for Preparation of Required Reports on PHG's
5 - Cost Estimates for Treatment Technologies
6 - Table of PHG Exceedances for 2010 to 2012
7 - Glossary of terms and abbreviations used in report

REFERENCE 1

State of California Health & Safety Code

Section 116470. Consumer Confidence Report

(a) As a condition of its operating permit, every public water system shall annually prepare a consumer confidence report and mail or deliver a copy of that report to each customer, other than an occupant, as defined in Section 799.28 of the Civil Code, of a recreational vehicle park. A public water system in a recreational vehicle park with occupants as defined in Section 799.28 of the Civil Code shall prominently display on a bulletin board at the entrance to or in the office of the park, and make available upon request, a copy of the report. The report shall include all of the following information:

(1) The source of the water purveyed by the public water system.

(2) A brief and plainly worded definition of the terms "maximum contaminant level," "primary drinking water standard," and "public health goal."

(3) If any regulated contaminant is detected in public drinking water supplied by the system during the past year, the report shall include all of the following information:

(A) The level of the contaminant found in the drinking water, and the corresponding public health goal and primary drinking water standard for that contaminant.

(B) Any violations of the primary drinking water standard that have occurred as a result of the presence of the contaminant in the drinking water and a brief and plainly worded statement of health concerns that resulted in the regulation of that contaminant.

(C) The public water system's address and phone number to enable customers to obtain further information concerning contaminants and potential health effects.

(4) Information on the levels of unregulated contaminants, if any, for which monitoring is required pursuant to state or federal law or regulation.

(5) Disclosure of any variances or exemptions from primary drinking water standards granted to the system and the basis therefor.

(b) On or before July 1, 1998, and every three years thereafter, public water systems serving more than 10,000 service connections that detect one or more contaminants in drinking water that exceed the applicable public health goal, shall prepare a brief written report in plain language that does all of the following:

(1) Identifies each contaminant detected in drinking water that exceeds the applicable public health goal.

(2) Discloses the numerical public health risk, determined by the office associated with the maximum contaminant level for each contaminant identified in paragraph (1) and the numerical public health risk determined by the office associated with the public health goal for that contaminant.

(3) Identifies the category of risk to public health, including, but not limited to, carcinogenic, mutagenic, teratogenic, and acute toxicity, associated with the exposure to the contaminant in drinking water, and includes a brief plainly worded description of these terms.

(4) Describes the best available technology, if any is then available on a commercial basis, to remove the contaminant or reduce the concentration of the contaminant. The public water system may, solely at its own discretion, briefly describe actions

that have been taken on its own, or by other entities, to prevent the introduction of the contaminant into drinking water supplies.

(5) Estimates the aggregate cost and the cost per customer of utilizing the technology described in paragraph (4), if any, to reduce the concentration of that contaminant in drinking water to a level at or below the public health goal.

(6) Briefly describes what action, if any, the local water purveyor intends to take to reduce the concentration of the contaminant in public drinking water supplies and the basis for that decision.

(c) Public water systems required to prepare a report pursuant to subdivision (b) shall hold a public hearing for the purpose of accepting and responding to public comment on the report. Public water systems may hold the public hearing as part of any regularly scheduled meeting.

(d) The department shall not require a public water system to take any action to reduce or eliminate any exceedance of a public health goal.

(e) Enforcement of this section does not require the department to amend a public water system's operating permit.

(f) Pending adoption of a public health goal by the Office of Environmental Health Hazard Assessment pursuant to subdivision (c) of Section 116365, and in lieu thereof, public water systems shall use the national maximum contaminant level goal adopted by the United States Environmental Protection Agency for the corresponding contaminant for purposes of complying with the notice and hearing requirements of this section.

(g) This section is intended to provide an alternative form for the federally required consumer confidence report as authorized by 42 U.S.S. Section 300g-3(c).

The California drinking water statutes are available on the Internet at the following address:
http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Lawbook/DWstatutes-2010-03-10.pdf

REFERENCE 2

Health Risk Information for Public Health Goal Exceedance Reports

Prepared by

Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

February 2013

Under the Calderon-Sher Safe Drinking Water Act of 1996 (the Act), water utilities are required to prepare a report every three years for contaminants that exceed public health goals (PHGs) (Health and Safety Code Section 116470 (2)[b]). The numerical health risk for a contaminant is to be presented with the category of health risk, along with a plainly worded description of these terms. The cancer health risk is to be calculated at the PHG and at the California maximum contaminant level (MCL). This report is prepared by the Office of Environmental Health Hazard Assessment (OEHHA) to assist the water utilities in meeting their requirements.

PHGs are concentrations of contaminants in drinking water that pose no significant health risk if consumed for a lifetime. PHGs are developed and published by OEHHA (Health and Safety Code Section 116365) using current risk assessment principles, practices and methods.

Numerical health risks. Table 1 presents health risk categories and cancer risk values for chemical contaminants in drinking water that have PHGs.

The Act requires that OEHHA publish PHGs based on health risk assessments using the most current scientific methods. As defined in statute, PHGs for non-carcinogenic chemicals in drinking water are set at a concentration "at which no known or anticipated adverse health effects will occur, with an adequate margin of safety." For carcinogens, PHGs are set at a concentration that "does not pose any significant risk to health." PHGs provide one basis for revising MCLs, along with cost and technological feasibility. OEHHA has been publishing PHGs since 1997 and the entire list published to date is shown in Table 1.

Table 2 presents health risk information for contaminants that do not have PHGs but have state or federal regulatory standards. The Act requires that, for chemical contaminants with California MCLs that do not yet have PHGs, water utilities use the

federal maximum contaminant level goal (MCLG) for the purpose of complying with the requirement of public notification. MCLGs, like PHGs, are strictly health based and include a margin of safety. One difference, however, is that the MCLGs for carcinogens are set at zero because the United States Environmental Protection Agency (U.S. EPA) assumes there is no absolutely safe level of exposure to them. PHGs, on the other hand, are set at a level considered to pose no *significant* risk of cancer; this is usually a no more than one-in-a-million excess cancer risk (1×10^{-6}) level for a lifetime of exposure. In Table 2, the cancer risks shown are based on the U.S. EPA's evaluations.

For more information on health risks: The adverse health effects for each chemical with a PHG are summarized in each PHG technical support document. These documents are available on the OEHHA Web site (http://www.oehha.ca.gov). Also, U.S. EPA has consumer and technical fact sheets on most of the chemicals having MCLs. For copies of the fact sheets, call the Safe Drinking Water Hotline at 1-800-426-4791, or explore the U.S. EPA Ground Water and Drinking Water web page at http://water.epa.gov/drink/.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Alachlor	carcinogenicity (causes cancer)	0.004	NA[5]	0.002	NA
Aluminum	neurotoxicity and immunotoxicity (harms the nervous and immune systems)	0.6	NA	1	NA
Antimony	digestive system toxicity (causes vomiting)	0.02	NA	0.006	NA
Arsenic	carcinogenicity (causes cancer)	0.000004 (4×10^{-6})	1×10^{-6} (one per million)	0.01	2.5×10^{-3} (2.5 per thousand)
Asbestos	carcinogenicity (causes cancer)	7 MFL[6] (fibers >10 microns in length)	1×10^{-6}	7 MFL (fibers >10 microns in length)	1×10^{-6} (one per million)
Atrazine	carcinogenicity (causes cancer)	0.00015	1×10^{-6}	0.001	7×10^{-6} (seven per million)

[1] Based on the OEHHA PHG technical support document unless otherwise specified. The categories are the hazard traits defined by OEHHA for California's Toxics Information Clearinghouse (online at: http://oehha.ca.gov/multimedia/green/pdf/GC_Regtext011912.pdf).
[2] mg/L = milligrams per liter of water or parts per million (ppm)
[3] Cancer Risk = Upper estimate of excess cancer risk from lifetime exposure. Actual cancer risk may be lower or zero. 1×10^{-6} means one excess cancer case per million people exposed.
[4] MCL = maximum contaminant level.
[5] NA = not applicable. Risk cannot be calculated. The PHG is set at a level that is believed to be without any significant public health risk to individuals exposed to the chemical over a lifetime.
[6] MFL = million fibers per liter of water.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Barium	cardiovascular toxicity (causes high blood pressure)	2	NA	1	NA
Bentazon	hepatotoxicity and digestive system toxicity (harms the liver, intestine, and causes body weight effects[7])	0.2	NA	0.018	NA
Benzene	carcinogenicity (causes leukemia)	0.00015	1×10^{-6}	0.001	7×10^{-6} (seven per million)
Benzo[a]pyrene	carcinogenicity (causes cancer)	0.000007	1×10^{-6}	0.0002	3×10^{-5} (three per hundred thousand)
Beryllium	digestive system toxicity (harms the stomach or intestine)	0.001	NA	0.004	NA
Bromate	carcinogenicity (causes cancer)	0.0001	1×10^{-6}	0.01	1×10^{-4} (one per ten thousand)
Cadmium	nephrotoxicity (harms the kidney)	0.00004	NA	0.005	NA
Carbofuran	reproductive toxicity (harms the testis)	0.0017	NA	0.018	NA

[7] Body weight effects are an indicator of general toxicity in animal studies.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Carbon tetrachloride	carcinogenicity (causes cancer)	0.0001	1×10^{-6}	0.0005	5×10^{-6} (five per million)
Chlordane	carcinogenicity (causes cancer)	0.00003	1×10^{-6}	0.0001	3×10^{-6} (three per million)
Chlorite	hematotoxicity (causes anemia) neurotoxicity (causes neurobehavioral effects)	0.05	NA	1	NA
Chromium, hexavalent	carcinogenicity (causes cancer)	0.00002	1×10^{-6}	---	NA
Copper	digestive system toxicity (causes nausea, vomiting, diarrhea)	0.3	NA	1.3 (AL)[8]	NA
Cyanide	neurotoxicity (damages nerves) endocrine toxicity (affects the thyroid)	0.15	NA	0.15	NA
Dalapon	nephrotoxicity (harms the kidney)	0.79	NA	0.2	NA
1,2-Dibromo-3-chloropropane (DBCP)	carcinogenicity (causes cancer)	0.0000017 (1.7×10^{-6})	1×10^{-6}	0.0002	1×10^{-4} (one per ten thousand)

[8] AL = action level. The action levels for copper and lead refer to a concentration measured at the tap. Much of the copper and lead in drinking water is derived from household plumbing (The Lead and Copper Rule, Title 22, California Code of Regulations [CCR] section 64672.3).

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
1,2-Dichloro-benzene (o-DCB)	hepatotoxicity (harms the liver)	0.6	NA	0.6	NA
1,4-Dichloro-benzene (p-DCB)	carcinogenicity (causes cancer)	0.006	1×10^{-6}	0.005	8×10^{-7} (eight per ten million)
1,1-Dichloro-ethane (1,1-DCA)	carcinogenicity (causes cancer)	0.003	1×10^{-6}	0.005	2×10^{-6} (two per million)
1,2-Dichloro-ethane (1,2-DCA)	carcinogenicity (causes cancer)	0.0004	1×10^{-6}	0.0005	1×10^{-6} (one per million)
1,1-Dichloro-ethylene (1,1-DCE)	hepatotoxicity (harms the liver)	0.01	NA	0.006	NA
1,2-Dichloro-ethylene, cis	nephrotoxicity (harms the kidney)	0.1	NA	0.006	NA
1,2-Dichloro-ethylene, trans	hepatotoxicity (harms the liver)	0.06	NA	0.01	NA
Dichloromethane (methylene chloride)	carcinogenicity (causes cancer)	0.004	1×10^{-6}	0.005	1×10^{-6} (one per million)
2,4-Dichloro-phenoxyacetic acid (2,4-D)	hepatotoxicity and nephrotoxicity (harms the liver and kidney)	0.02	NA	0.07	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
1,2-Dichloro-propane (propylene dichloride)	carcinogenicity (causes cancer)	0.0005	1×10^{-6}	0.005	1×10^{-5} (one per hundred thousand)
1,3-Dichloro-propene (Telone II®)	carcinogenicity (causes cancer)	0.0002	1×10^{-6}	0.0005	2×10^{-6} (two per million)
Di(2-ethylhexyl) adipate (DEHA)	developmental toxicity (disrupts development)	0.2	NA	0.4	NA
Diethylhexyl-phthalate (DEHP)	carcinogenicity (causes cancer)	0.012	1×10^{-6}	0.004	3×10^{-7} (three per ten million)
Dinoseb	reproductive toxicity (harms the uterus and testis)	0.014	NA	0.007	NA
Dioxin (2,3,7,8-TCDD)	carcinogenicity (causes cancer)	5×10^{-11}	1×10^{-6}	3×10^{-8}	6×10^{-4} (six per ten thousand)
Diquat	ocular toxicity (harms the eye) developmental toxicity (causes malformation)	0.015	NA	0.02	NA
Endothall	digestive system toxicity (harms the stomach or intestine)	0.58	NA	0.1	NA
Endrin	hepatotoxicity (harms the liver) neurotoxicity (causes convulsions)	0.0018	NA	0.002	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Ethylbenzene (phenylethane)	hepatotoxicity (harms the liver)	0.3	NA	0.3	NA
Ethylene dibromide	carcinogenicity (causes cancer)	0.00001	1×10^{-6}	0.00005	5×10^{-6} (five per million)
Fluoride	musculoskeletal toxicity (causes tooth mottling)	1	NA	2	NA
Glyphosate	nephrotoxicity (harms the kidney)	0.9	NA	0.7	NA
Heptachlor	carcinogenicity (causes cancer)	0.000008	1×10^{-6}	0.00001	1×10^{-6} (one per million)
Heptachlor epoxide	carcinogenicity (causes cancer)	0.000006	1×10^{-6}	0.00001	2×10^{-6} (two per million)
Hexachloroben-zene	carcinogenicity (causes cancer)	0.00003	1×10^{-6}	0.001	3×10^{-5} (three per hundred thousand)
Hexachloro-cyclopentadiene (HEX)	digestive system toxicity (causes stomach lesions)	0.05	NA	0.05	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Lead	developmental neurotoxicity (causes neurobehavioral effects in children) cardiovascular toxicity (cause high blood pressure) carcinogenicity (causes cancer)	0.0002	3×10^{-8} (PHG is not based on this effect)	0.015 (AL)[8]	2×10^{-6} (two per million)
Lindane (γ-BHC)	carcinogenicity (causes cancer)	0.000032	1×10^{-6}	0.0002	6×10^{-6} (six per million)
Mercury (inorganic)	nephrotoxicity (harms the kidney)	0.0012	NA	0.002	NA
Methoxychlor	endocrine toxicity (causes hormone effects)	0.00009	NA	0.03	NA
Methyl tertiary-butyl ether (MTBE)	carcinogenicity (causes cancer)	0.013	1×10^{-6}	0.013	1×10^{-6} (one per million)
Molinate	carcinogenicity (causes cancer)	0.001	1×10^{-6}	0.02	2×10^{-5} (two per hundred thousand)
Monochloro-benzene (chlorobenzene)	hepatotoxicity (harms the liver)	0.2	NA	0.07	NA
Nickel	developmental toxicity (causes increased neonatal deaths)	0.012	NA	0.1	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Nitrate	hematotoxicity (causes methemoglobinemia)	45 as nitrate	NA	45 as NO_3	NA
Nitrite	hematotoxicity (causes methemoglobinemia)	1 as nitrogen	NA	1 as nitrite-nitrogen	NA
Nitrate and Nitrite	hematotoxicity (causes methemoglobinemia)	10 as nitrogen	NA	10 as nitrogen	NA
N-nitroso-dimethyl-amine (NDMA)	carcinogenicity (causes cancer)	0.000003	$1x10^{-6}$	---	NA
Oxamyl	general toxicity (causes body weight effects)	0.026	NA	0.05	NA
Pentachloro-phenol (PCP)	carcinogenicity (causes cancer)	0.0003	1×10^{-6}	0.001	3×10^{-6} (three per million)
Perchlorate	endocrine toxicity (affects the thyroid) developmental toxicity (causes neurodevelop-mental deficits)	0.006[9]	NA	0.006	NA
Picloram	hepatotoxicity (harms the liver)	0.5	NA	0.5	NA

[9] This is the current PHG value for perchlorate. A revised draft PHG for perchlorate was posted online for public comment on December 7, 2012. http://www.oehha.ca.gov/water/phg/120712Perchlorate.html.

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Polychlorinated biphenyls (PCBs)	carcinogenicity (causes cancer)	0.00009	1×10^{-6}	0.0005	6×10^{-6} (six per million)
Radium-226	carcinogenicity (causes cancer)	0.05 pCi/L	1×10^{-6}	5 pCi/L	1×10^{-4} (one per ten thousand)
Radium-228	carcinogenicity (causes cancer)	0.019 pCi/L	1×10^{-6}	5 pCi/L (combined $Ra^{226+228}$)	3×10^{-4} (three per ten thousand)
Selenium	integumentary toxicity (causes hair loss and nail damage)	0.03	NA	0.05	NA
Silvex (2,4,5-TP)	hepatotoxicity (harms the liver)	0.025	NA	0.05	NA
Simazine	general toxicity (causes body weight effects)	0.004	NA	0.004	NA
Strontium-90	carcinogenicity (causes cancer)	0.35 pCi/L	$1x10^{-6}$	8 pCi/L	2×10^{-5} (two per hundred thousand)
Styrene (vinylbenzene)	carcinogenicity (causes cancer)	0.0005	$1x10^{-6}$	0.1	2×10^{-4} (two per ten thousand)

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
1,1,2,2-Tetrachloro-ethane	carcinogenicity (causes cancer)	0.0001	1×10^{-6}	0.001	1×10^{-5} (one per hundred thousand)
Tetrachloro-ethylene (perchloro-ethylene, or PCE)	carcinogenicity (causes cancer)	0.00006	1×10^{-6}	0.005	8×10^{-5} (eight per hundred thousand)
Thallium	integumentary toxicity (causes hair loss)	0.0001	NA	0.002	NA
Thiobencarb	general toxicity (causes body weight effects) hematotoxicity (affects red blood cells)	0.07	NA	0.07	NA
Toluene (methylbenzene)	hepatotoxicity (harms the liver) endocrine toxicity (harms the thymus)	0.15	NA	0.15	NA
Toxaphene	carcinogenicity (causes cancer)	0.00003	1×10^{-6}	0.003	1×10^{-4} (one per ten thousand)
1,2,4-Trichloro-benzene (Unsym-TCB)	endocrine toxicity (harms adrenal glands)	0.005	NA	0.005	NA

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
1,1,1-Trichloro-ethane	neurotoxicity (harms the nervous system), reproductive toxicity (causes fewer offspring) hepatotoxicity (harms the liver) hematotoxicity (causes blood effects)	1	NA	0.2	NA
1,1,2-Trichloro-ethane	carcinogenicity (causes cancer)	0.0003	$1x10^{-6}$	0.005	2×10^{-5} (two per hundred thousand)
1,1,2-Trichloro-ethylene (TCE)	carcinogenicity (causes cancer)	0.0017	1×10^{-6}	0.005	3×10^{-6} (three per million)
Trichlorofluoro-methane (Freon 11)	hepatotoxicity (harms the liver)	0.7	NA	0.15	NA
1,2,3-Trichloro-propane (1,2,3-TCP)	carcinogenicity (causes cancer)	0.0000007	$1x10^{-6}$	---	NA
1,1,2-Trichloro-1,2,2-trifluoro-ethane (Freon 113)	hepatotoxicity (harms the liver)	4	NA	1.2	NA
Tritium	carcinogenicity (causes cancer)	400 pCi/L	$1x10^{-6}$	20,000 pCi/L	$5x10^{-5}$ (five per hundred thousand)

Table 1: Health Risk Categories and Cancer Risk Values for Chemicals with California Public Health Goals (PHGs)

Chemical	Health Risk Category[1]	California PHG (mg/L)[2]	Cancer Risk[3] at the PHG	California MCL[4] (mg/L)	Cancer Risk at the California MCL
Uranium	carcinogenicity (causes cancer)	0.43 pCi/L	1×10^{-6}	20 pCi/L	5×10^{-5} (five per hundred thousand)
Vinyl chloride	carcinogenicity (causes cancer)	0.00005	1×10^{-6}	0.0005	1×10^{-5} (one per hundred thousand)
Xylene	neurotoxicity (affects the senses, mood, and motor control)	1.8 (single isomer or sum of isomers)	NA	1.75 (single isomer or sum of isomers)	NA

Table 2: Health Risk Categories and Cancer Risk Values for Chemicals without California Public Health Goals

Chemical	Health Risk Category[1]	U.S. EPA MCLG[2] (mg/L)	Cancer Risk[3] @ MCLG	California MCL[4] (mg/L)	Cancer Risk @ California MCL
Disinfection byproducts (DBPS)					
Chloramines	acute toxicity (causes irritation) digestive system toxicity (harms the stomach) hematotoxicity (causes anemia)	4[5]	NA	none	NA
Chlorine	acute toxicity (causes irritation) digestive system toxicity (harms the stomach)	4[5]	NA	none	NA
Chlorine dioxide	hematotoxicity (causes anemia) neurotoxicity (harms the nervous system)	0.8[5]	NA	none	NA
Disinfection byproducts: haloacetic acids (HAA5)					
Chloroacetic acid	general toxicity (causes body and organ weight changes[6])	0.07	NA	none	NA
Dichloroacetic acid	carcinogenicity (causes cancer)	0	0	none	NA
Trichloroacetic acid	hepatotoxicity (harms the liver)	0.02	0	none	NA
Bromoacetic acid	NA	none	NA	none	NA

[1] Health risk category based on the U.S. EPA MCLG document or California MCL document unless otherwise specified.
[2] MCLG = maximum contaminant level goal established by U.S. EPA.
[3] Cancer Risk = Upper estimate of excess cancer risk from lifetime exposure. Actual cancer risk may be lower or zero. 1×10^{-6} means one excess cancer case per million people exposed.
[4] California MCL = maximum contaminant level established by California.
[5] Maximum Residual Disinfectant Level Goal, or MRDLG
[6] Body weight effects are an indicator of general toxicity in animal studies.

Table 2: Health Risk Categories and Cancer Risk Values for Chemicals without California Public Health Goals

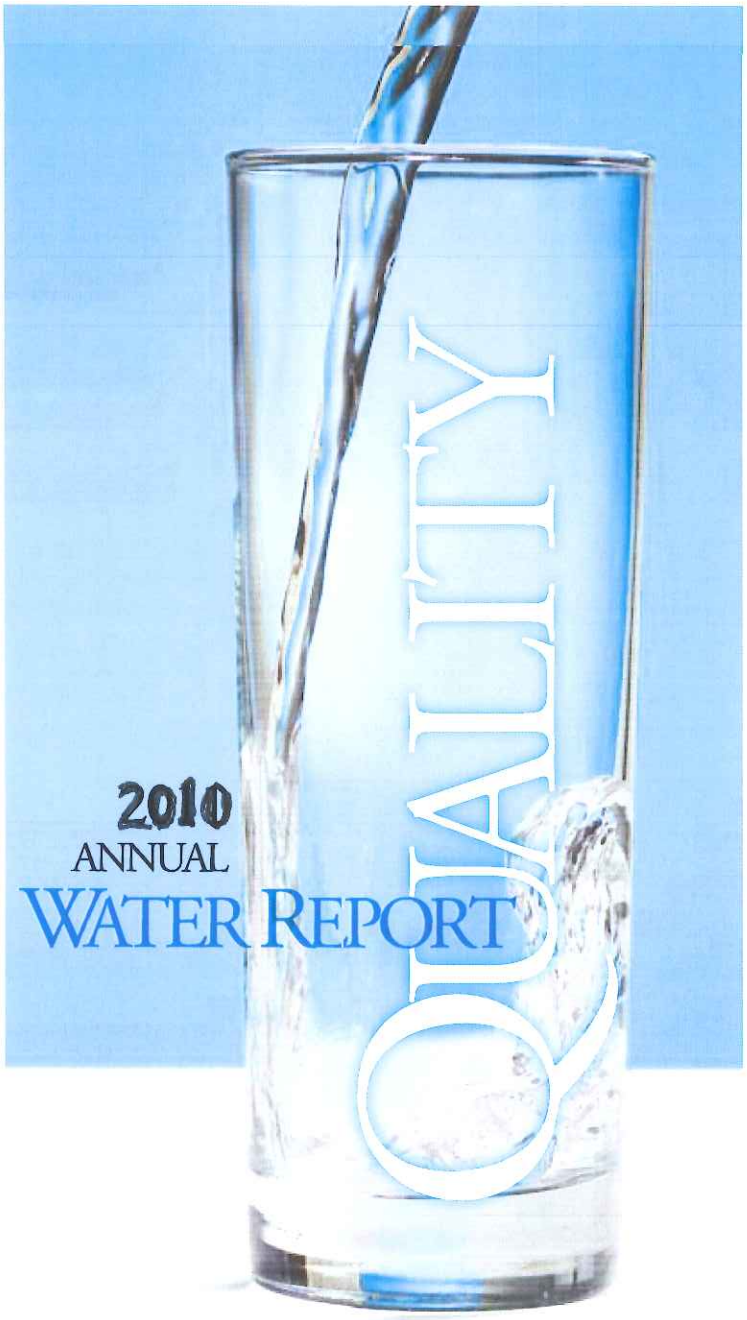
Chemical	Health Risk Category[1]	U.S. EPA MCLG[2] (mg/L)	Cancer Risk[3] @ MCLG	California MCL[4] (mg/L)	Cancer Risk @ California MCL
Dibromoacetic acid	NA	none	NA	none	NA
Total haloacetic acids	carcinogenicity (causes cancer)	none	NA	0.06	NA
Disinfection byproducts: trihalomethanes (THMs)					
Bromodichloro-methane (BDCM)	carcinogenicity (causes cancer)	0	0	none	NA
Bromoform	carcinogenicity (causes cancer)	0	0	none	NA
Chloroform	hepatotoxicity and nephrotoxicity (harms the liver and kidney)	0.07	NA	none	NA
Dibromo-chloromethane (DBCM)	hepatotoxicity, nephrotoxicity, and neurotoxicity (harms the liver, kidney, and nervous system)	0.06	NA	none	NA
Total (sum of BDCM, bromoform, chloroform and DBCM)	carcinogenicity (causes cancer), hepatotoxicity, nephrotoxicity, and neurotoxicity (harms the liver, kidney, and nervous system)	none	NA	0.08	NA

Table 2: Health Risk Categories and Cancer Risk Values for Chemicals without California Public Health Goals

Chemical	Health Risk Category[1]	U.S. EPA MCLG[2] (mg/L)	Cancer Risk[3] @ MCLG	California MCL[4] (mg/L)	Cancer Risk @ California MCL
Radionuclides					
Gross alpha particles[7]	carcinogenicity (causes cancer)	0 (^{210}Po included)	0	15 pCi/L[8] (includes ^{226}Ra but not radon and uranium)	up to $1x10^{-3}$ (for ^{210}Po, the most potent alpha emitter
Beta particles and photon emitters[7]	carcinogenicity (causes cancer)	0 (^{210}Pb included)	0	50 pCi/L (judged equiv. to 4 mrem/yr)	up to $2x10^{-3}$ (for ^{210}Pb, the most potent beta-emitter)

[7] MCLs for gross alpha and beta particles are screening standards for a group of radionuclides. Corresponding PHGs were not developed for gross alpha and beta particles. See the OEHHA memoranda discussing the cancer risks at these MCLs at http://www.oehha.ca.gov/water/phg/index.html.
[8] pCi/L = picocuries per liter of water.

REFERENCE 3A



2010 ANNUAL WATER REPORT

Presented By
City of Vacaville

PWS ID#: 4810008

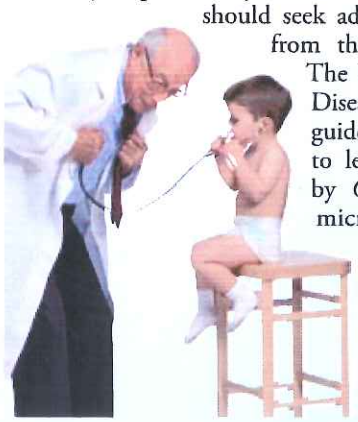
Quality First

The City of Vacaville wants our customers to know that your water has met or exceeded all quality standards established by the U.S. Environmental Protection Agency (USEPA) and the California Department of Public Health (DPH). In 2010, Vacaville delivered over 5.3 billion gallons of drinking water. This water was subjected to extensive testing, not only for regulated but also for non-regulated contaminants. For a complete table of analyses of Vacaville's water and other facts, see our website at http://www.cityofvacaville.com. We welcome your comments or questions about this report and invite you to join our source water protection efforts. Please contact the City of Vacaville Water Quality Lab Supervisor Tony Pirondini by calling (707) 469-6400 or by email at TPirondini@cityofvacaville.com.

Important Health Information

While arsenic levels in your drinking water are less than the current USEPA standard of 10 ppb, the groundwater does contain low levels of arsenic. These results are from samples taken in 2008–2010. The standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The USEPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants may be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. The USEPA/CDC (Centers for Disease Control and Prevention) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791 or http://water.epa.gov/drink/hotline.



Source Water Assessments and Vulnerability Summaries

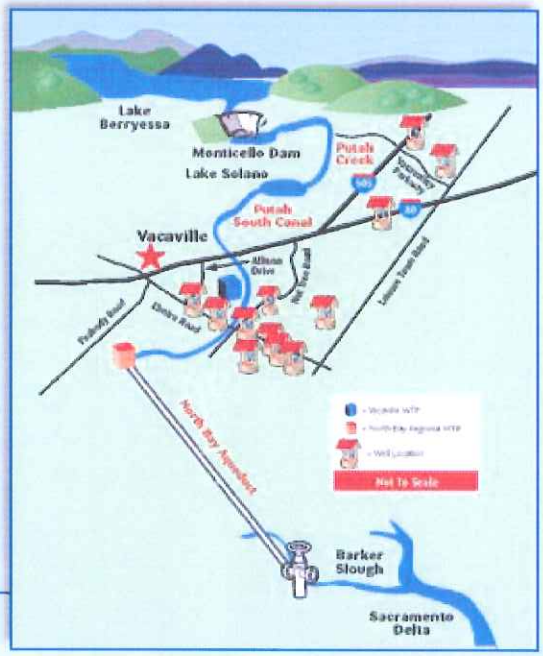
A Source Water Assessment evaluates the quality of a source water that is used in a community drinking water supply and to determine the Potential Contributing Activities (PCAs) that occur within and nearby a source water supply. The PCAs are compiled into a Vulnerability Summary. The latest Vulnerability Summary for the Sacramento Delta, including the Barker Slough North Bay Aqueduct (NBA), was completed in 2006, and the source was considered to be most vulnerable to cattle and sheep grazing activities in the watershed. The cities treating NBA water, in conjunction with the Solano County Water Agency, have implemented practices to improve water quality.

The latest Vulnerability Summary for Putah South Canal (PSC) was completed in 2006. The report determined that PSC has a physical barrier effectiveness rating of "low" and indicated that PSC is most vulnerable to illegal activities/ unauthorized dumping and herbicide application. Management measures along the canal have been implemented that mitigate the risk for each of these PCAs. These measures include improved security, the reduction of herbicide use, and diversion of surface drainage around and away from the canal.

The Vulnerability Summaries for Vacaville's groundwater wells were performed in 2002, 2003, and 2005. The wells are considered most vulnerable to gas stations, chemical and petroleum processing and storage, dry cleaners, septic systems, sewer collection systems, agricultural drainage, and agricultural and irrigation wells. The wells offer various levels of protection from PCAs, including well construction features and physical barriers. No contamination of the water sources has been detected. Vacaville's long-standing Source Control Program works to ensure that no illicit discharges are taking place and to confirm that pollutant disposal practices conform to guidelines and laws. A copy of the Source Water Assessments and Vulnerability Summaries can be obtained through the California DPH, Drinking Water Field Operations Branch, San Francisco District Office, 850 Marina Bay Parkway, Bldg P, 2nd Floor, Richmond, California 94804. You may request that a summary be sent to you by contacting Betty Graham, District Engineer, California Department of Public Health, at (510) 620-3474.

Where Does My Water Come From?

Vacaville's water supply consists of two surface water sources and 12 deep groundwater wells. Depending on where you live, your water may come from a well, a treatment plant or a combination of both. In the year 2010, Lake Berryessa surface water, conveyed through Putah South Canal (PSC), provided 24 percent of the City's total consumption; Sacramento Delta surface water from the North Bay Aqueduct (NBA) provided an additional 45 percent. Groundwater from the 12 deep wells made up the balance (31 percent) of our water needs. Treatment for surface water is divided between the Vacaville Water Treatment Plant (VWTP), located on Allison Drive, and the North Bay Regional Water Treatment Plant (NBR), located on Peabody Road. The wells are located on or near Elmira Road, Orange Drive, and Vaca Valley Parkway.



Lead in Home Plumbing

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. We are responsible for providing high-quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at www.epa.gov/safewater/lead.

Community Participation

You are invited to voice your concerns about your drinking water at City Council meetings held on the second and fourth Tuesdays each month at 7:00 p.m. in the Council Chambers at City Hall, at 650 Merchant Street. All residents are encouraged to participate in these meetings. Agendas and minutes for the meeting are available on-line at the City of Vacaville website: http://www.cityofvacaville.com.

Sources of Water and Contaminants

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

In order to ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (USEPA) and the State Department of Public Health (Department) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that must provide the same protection for public health. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk.

Contaminants that may be present in source water include: **Microbial Contaminants**, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife; **Inorganic Contaminants**, such as salts and metals, that can be naturally occurring or can result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming; **Pesticides and Herbicides**, that may come from a variety of sources, such as agriculture, urban stormwater runoff, and residential uses; **Organic Chemical Contaminants**, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production and which can also come from gas stations, urban stormwater runoff, agricultural applications, and septic systems; **Radioactive Contaminants**, that can be naturally occurring or can be the result of oil and gas production and mining activities.

More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at (800) 426-4791.

Sampling Results

The City monitors your drinking water for more than 100 different constituents. Only those constituents detected are reported in the tables. While most monitoring was conducted in 2010, the State allows monitoring for some constituents less than once per year. Some of our data, therefore, are more than one year old. More information can be obtained about monitoring requirements, contaminants, and potential health effects by calling the USEPA's Safe Drinking Water Hotline (800-426-4791) or by visiting the EPA's website at www.epa.

REGULATED SUBSTANCES

				Groundwater Wells		Distribution System (Cannot differentiate by source)		Surface Water Sources			
SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	MCL [MRDL]	PHG (MCLG) [MRDLG]	AMOUNT DETECTED	RANGE LOW-HIGH	AMOUNT DETECTED	RANGE LOW-HIGH	AMOUNT DETECTED	RANGE LOW-HIGH	VIOLATION	TYPICAL SOURCE
Aluminum (ppm)	2010	1	0.6	ND	ND	NA	NA	0.032	0.021–0.058	No	Erosion of natural deposits; residue from some surface water treatment processes
Arsenic (ppb)	2008	10	0.004	2.9	1.2–8.1	NA	NA	1[1]	ND–4[1]	No	Erosion of natural deposits; glass and electronics production wastes
Barium (ppm)	2008	1	2	0.093	0.067–0.120	NA	NA	0.042[1]	0.034–0.050[1]	No	Erosion of natural deposits
Bromate (ppb)	2010	10	0.1	NA	NA	1.7	ND–4.3	NA	NA	No	By-product of drinking water disinfection
Chlorine (ppm)	2010	[4.0 (as Cl2)]	[4]	NA	NA	0.75	ND–1.5	NA	NA	No	Drinking water disinfectant added for treatment
Chromium (ppb)	2008	50	(100)	11	1.7–21	NA	NA	1	ND–4	No	Discharge from chrome plating; erosion of natural deposits
Control of DBP precursors [TOC] (ppm)	2010	TT	NA	NA	NA	0.6	ND–2.6	NA	NA	No	Various natural and manmade sources
Fluoride (ppm)	2010	2.0	1	0.3	0.2–0.4	0.9[2]	0.7–1.0[2]	0.07	ND–0.16	No	Erosion of natural deposits; water additive that promotes strong teeth
Gross Alpha Particle Activity (pCi/L)	2008	15	(0)	ND	ND–3.8	NA	NA	ND	ND	No	Erosion of natural deposits
Gross Beta Particle Activity[3] (pCi/L)	2008	50	(0)	3.5	1.5–5.9	NA	NA	ND	ND	No	Decay of natural and manmade deposits
Haloacetic Acids (ppb)	2010	60	NA	ND	ND	8.3	ND–28	ND	ND	No	By-product of drinking water disinfection
Nickel (ppb)	2010	100	12	NA	NA	NA	NA	4	ND–16	No	Erosion of natural deposits; discharge from metal factories
Nitrate [as nitrate] (ppm)	2010	45	45	7.7	2.0–17.6	NA	NA	4.1	ND–7.4	No	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
TTHMs [Total Trihalomethanes] (ppb)	2010	80	NA	ND	ND	23	ND–54	17	0.6–63	No	By-product of drinking water disinfection
Total Coliform Bacteria [Total Coliform Rule][4] (% positive samples)	2010	More than 5.0% of monthly samples are positive	(0)	NA	NA	1.5	NA	NA	NA	No	Naturally present in the environment
Turbidity[5] (NTU)	2008	TT	NA	2.6	0.05–2.6	NA	NA	0.29[1]	0.03–0.29[1]	No	Soil runoff
Turbidity (Lowest monthly percent of samples meeting limit)	2010	TT=95% of samples<0.3	NA	NA	NA	NA	NA	100	NA	No	Soil runoff

Tap water samples were collected for lead and copper analyses from sample sites throughout the community

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	AL	PHG (MCLG)	AMOUNT DETECTED (90TH%TILE)	SITES ABOVE AL/ TOTAL SITES	VIOLATION	TYPICAL SOURCE
Copper (ppm)	2008	1.3	0.3	0.17	0/32	No	Internal corrosion of household plumbing systems; erosion of natural deposits
Lead (ppb)	2008	15	0.2	2.5	0/32	No	Internal corrosion of household water plumbing systems; erosion of natural deposits

SECONDARY SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	SMCL	PHG (MCLG)	Groundwater Wells AMOUNT DETECTED	Groundwater Wells RANGE LOW-HIGH	Surface Water Sources AMOUNT DETECTED	Surface Water Sources RANGE LOW-HIGH	VIOLATION	TYPICAL SOURCE
Aluminum (ppb)	2010	200	NS	ND	ND	32	21–58	No	Erosion of natural deposits; residual from some surface water treatment processes
Chloride (ppm)	2008	500	NS	15	7.9–33	13[1]	8–20[1]	No	Runoff/leaching from natural deposits
Copper (ppm)	2008	1.0	NS	0.9	ND–3.7	ND	ND	No	Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
Iron (ppb)	2008	300	NS	3	ND–35	ND	ND	No	Leaching from natural deposits; industrial wastes
Odor–Threshold (TON)	2008	3	NS	1	1–3	1.6[1]	1.4–2.0[1]	No	Naturally occurring organic materials
Silver (ppb)	2010	100	NS	ND	ND	4	ND–16	No	Industrial discharges
Specific Conductance (µS/cm)	2008	1,600	NS	587	471–846	328[1]	283–356[1]	No	Substances that form ions when in water
Sulfate (ppm)	2008	500	NS	41	24–66	34[1]	23–43[1]	No	Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (ppm)	2008	1,000	NS	367	270–546	202[1]	186–222[1]	No	Runoff/leaching from natural deposits
Zinc (ppm)	2008	5.0	NS	0.008	ND–0.065	ND	ND	No	Runoff/leaching from natural deposits; industrial wastes

UNREGULATED AND OTHER SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	Groundwater Wells AMOUNT DETECTED	Groundwater Wells RANGE LOW-HIGH	Surface Water Sources AMOUNT DETECTED	Surface Water Sources RANGE LOW-HIGH	TYPICAL SOURCE
Alkalinity (ppm)	2008	211	161–305	126[1]	74–162[1]	Naturally occurring due to carbonates and bicarbonates dissolved in water
Boron (ppb)	2008	200	110–310	166[1]	120–220[1]	Leaching from natural deposits
Bromide (ppm)	2010	NA	NA	0.021	0.014–0.027	NA
Calcium (ppm)	2008	44	14–85	17[1]	14–19[1]	Contributes to hardness; leaching from natural deposits
Hardness (ppm)	2008	190	84–330	136[1]	75–173[1]	Measure of calcium and magnesium dissolved in water
Magnesium (ppm)	2008	20	12–28	22[1]	10–31[1]	Contributes to hardness; leaching from natural deposits
Molybdenum (ppb)	2008	0.2	ND–3	ND	ND	Leaching from natural deposits; industrial wastes
pH (Units)	2008	7.9	7.7–8.2	8.1[1]	8.0–8.2[1]	Naturally occurring
Potassium (ppm)	2008	3.8	2.3–6.1	1.5[1]	0.9–2[1]	Leaching from natural deposits
Sodium (ppm)	2008	58	39–82	26[1]	12–39[1]	Leaching from natural deposits
Total Organic Carbon [source] (ppm)	2010	0.01	ND– 0.05	1.9	1.5–2.6	Various natural and manmade sources
Vanadium (ppb)	2008	14	8–26	4.2[1]	3.1–7.0[1]	Leaching from natural deposits; industrial wastes

Footnotes:

[1] Sampled in 2010.

[2] Sampled in 2008.

[3] Effective 6/11/2006, the gross beta particle activity MCL is 4 millirem/year annual dose equivalent to the total body or any internal organ. 50 pCi/L is used as a screening level.

[4] Of 1,352 samples taken in 2010, only 3 sites had Total Coliforms detected. No sites tested positive upon resampling.

[5] Turbidity is a measure of the cloudiness of the water.

Definitions

AL (Regulatory Action Level): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

µS/cm (microsiemens per centimeter): A unit expressing the amount of electrical conductivity of a solution.

MCL (Maximum Contaminant Level): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs (SMCLs) are set to protect the odor, taste, and appearance of drinking water.

MCLG (Maximum Contaminant Level Goal): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. EPA.

MRDL (Maximum Residual Disinfectant Level): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG (Maximum Residual Disinfectant Level Goal): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

NA: Not applicable.

ND (Not detected): Indicates that the substance was not found by laboratory analysis.

NS: No standard.

NTU (Nephelometric Turbidity Units): Measurement of the clarity, or turbidity, of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

pCi/L (picocuries per liter): A measure of radioactivity.

PDWS (Primary Drinking Water Standard): MCLs and MRDLs for contaminants that affect health, along with their monitoring and reporting requirements and water treatment requirements.

PHG (Public Health Goal): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California EPA.

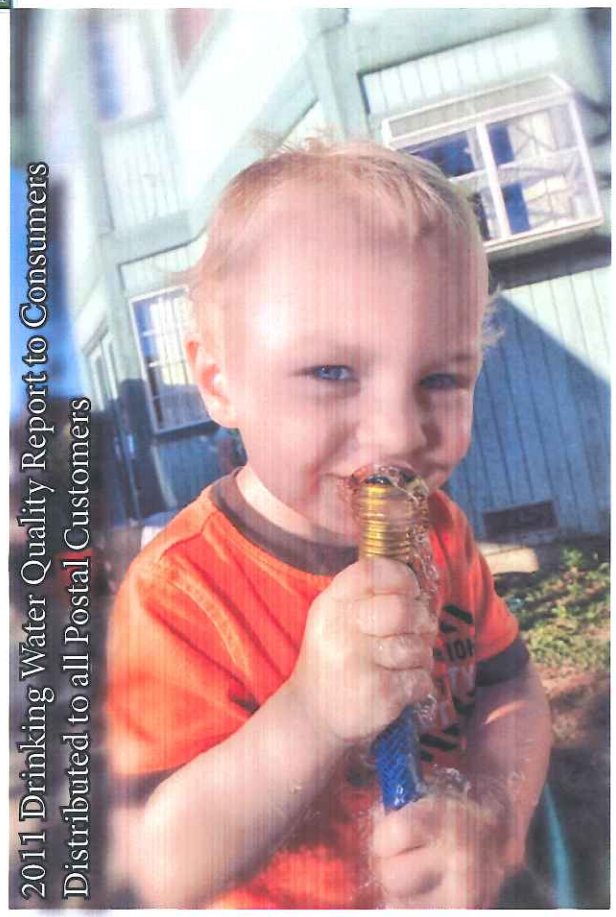
ppb (parts per billion): One part substance per billion parts water (or micrograms per liter).

ppm (parts per million): One part substance per million parts water (or milligrams per liter).

TON (Threshold Odor Number): A measure of odor in water.

TT (Treatment Technique): A required process intended to reduce the level of a contaminant in drinking water.

City of Vacaville 2011 Drinking Water Quality Report to Consumers



POLICY ON NONDISCRIMINATION ON THE BASIS OF DISABILITY

In accordance with the requirements of Title II of the Americans with Disabilities Act of 1990, the City of Vacaville ("City") does not discriminate against qualified individuals with disabilities on the basis of disability in the City's services, programs or activities, or employment. Information, comments, requests for accommodations or barrier removal, and/ or complaints concerning the accessibility of City programs, services or activities to persons with disabilities should be directed to the City's ADA Coordinator, 650 Merchant Street, 449-5409, 449-5162 (TTY), or ada@cityofvacaville.com.

THE CITY OF VACAVILLE:

wants you, our customers, to know that your water system has met all water quality standards established by the U.S. Environmental Protection Agency (USEPA) and the California State Department of Public Health (DPH) and is a safe and reliable supply. In 2011 Vacaville distributed over 5.2 billion gallons of drinking water. This water was subjected to extensive testing, not only for regulated contaminants, but also for non-regulated. More than 7,000 analyses were performed on water samples in 2011.

In order to ensure that tap water is safe to drink, the USEPA and the DPH prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DPH regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at (1-800-426-4791), or visit the web site at http://www.epa.gov/safewater/.

For a full table of analyses of Vacaville's water and other facts, see our web site at http://www.cityofvacaville.com. We would like to hear your comments on this report and invite you to join our source water protection efforts. Please contact the City of Vacaville Water Quality Lab Supervisor, Therese Spence by phone at (707) 469-6400 or by email at tspence@cityofvacaville.com.

SOURCES OF WATER & CONTAMINANTS:

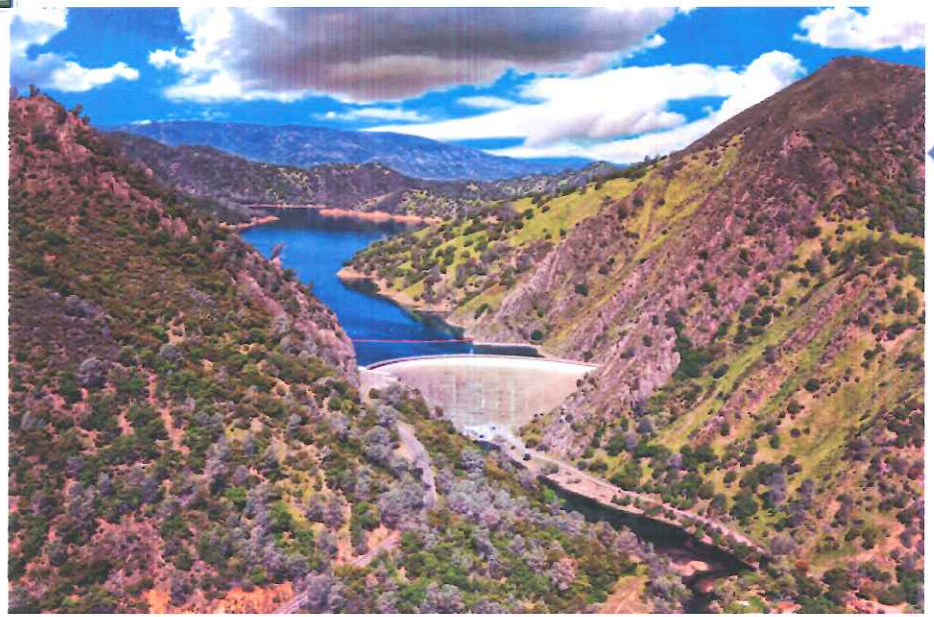
The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Vacaville's water supply consists of two surface water sources and 12 deep groundwater wells. Lake Berryessa surface water, conveyed through Putah South Canal (PSC), provided 28% of the City's total consumption; and Sacramento Delta surface water, from the North Bay Aqueduct (NBA), provided an additional 41% in the year 2011. Groundwater from the 12 deep wells made-up the balance (31%) of our water needs. Treatment for surface water is divided between the Vacaville Water Treatment Plant (VWTP), located on Allison Drive and the North Bay Regional Water Treatment Plant (NBR), located on Peabody Road. The VWTP treats PSC source water only, while the NBR plant, which is jointly-owned by the cities of Vacaville and Fairfield, treats both PSC and NBA source waters. The deep groundwater wells are located on or near Elmira Road, Orange Drive, and Vaca Valley Parkway.

CONTAMINANTS THAT MAY BE PRESENT IN SOURCE WATER INCLUDE:

- Microbial contaminants, such as viruses and bacteria that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife;
- Inorganic contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming;
- Pesticides and herbicides that may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses;
- Organic chemical contaminants, including synthetic and volatile organic chemicals, that are by-products of industrial processes and petroleum production and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems; and
- Radioactive contaminants that can be naturally-occurring or be the result of oil and gas production and mining activities.

REFERENCE 3B

City of Vacaville 2011 Drinking Water Quality Report to Consumers



SOLANO WATER

BE GREEN, SAVE BLUE™

SOLANO IRRIGATION DISTRICT SINCE 1948

LEAD IN DRINKING WATER:

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with older service lines and home plumbing. The City of Vacaville is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 800-426-4791 or at http://www.epa.gov/safewater/lead.

ARSENIC IN DRINKING WATER:

Vacaville Meets the Limit

While arsenic levels in your drinking water are less than the current USEPA standard of 10 ppb, the groundwater does contain low levels of arsenic. Results in this report are from samples taken in 2011. The standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The USEPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

Protect Your Water Supply

Polluted stormwater potentially affects drinking water sources, which can affect public health and increase drinking water treatment costs. Please help protect your water supply by controlling household, landscaping and automotive products that contain toxic chemicals. Reduce the use of toxic chemicals wherever possible (including fertilizers and pesticides) and be sure to properly recycle or dispose of waste. Everything that goes down a storm drain or sewer may potentially affect your local water. Never dispose of household, landscaping or automotive products and chemicals down the storm drain or in the sewer.

MONITORING

The City monitors your drinking water for more than 100 different constituents. Some constituents are tested daily to ensure the water is safe to drink. Only those constituents detected are reported in the tables. More information can be obtained about monitoring requirements, contaminants and potential health effects by calling the USEPA's Safe Drinking Water Hotline (800-426-4791) or by visiting the EPA's web site at www.epa.gov/safewater/hfacts.html/.

SOURCE WATER ASSESSMENTS AND VULNERABILITY SUMMARIES:

A Source Water Assessment evaluates the quality of water that is used in a community drinking water supply. It is also used to determine the Potential Contributing Activities (PCAs) that occur nearby and within a source water supply. The PCAs are then compiled into a Vulnerability Summary report. The latest Vulnerability Summary report for the Sacramento Delta, including the Barker Slough North Bay Aqueduct (NBA), was completed in 2006. The source was considered to be most vulnerable to cattle and sheep grazing activities in the watershed associated with turbidity, total organic carbon, and coliform bacteria detected in the water supply. Approximately 85% of the watershed is grazing land or irrigated pastures. The cities treating NBA water, in conjunction with the Solano County Water Agency, have implemented watershed management practices to improve water quality and reduce the significance of the potential contaminant sources. The latest Vulnerability Summary report for Putah South Canal (PSC) was completed in 2006. PSC was determined to have a physical barrier effectiveness rating of "low." The results of the assessment survey indicated that PSC is most vulnerable to illegal activities/unauthorized dumping and herbicide application. Management measures along the canal have been implemented that mitigate the risk for each of these PCAs. The Vulnerability Summaries for Vacaville's groundwater wells were performed in 2002, 2003, and 2005. The wells are considered most vulnerable to automobile gas stations, chemical and petroleum processing and storage, dry cleaners, septic systems, sewer collection systems, agricultural drainage and agricultural and irrigation wells. The wells offer various levels of protection from PCAs due to factors such as characteristics of the aquifer, deep water table intakes, well construction features and physical barriers. A copy of the Source Water Assessment(s) and Vulnerability Summaries can be obtained through the California DPH, Drinking Water Field Operations Branch, San Francisco District Office, 850 Marina Bay Parkway, Bldg P, 2nd Floor, Richmond, California 94804. You may request that a summary be sent to you by contacting Betty Graham, District Engineer, California Department of Public Health, at (510) 620-3474.

HEALTH RELATED INFORMATION

PRECAUTIONS FOR PEOPLE WITH WEAKENED IMMUNE SYSTEMS:

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised people such as those with cancer undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA and Center for Disease Control guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants can be obtained by calling USEPA's Safe Drinking Water Hotline (800-426-4791) or visiting the web site at www.epa.gov/.

City of Vacaville 2011 Drinking Water Quality Report to Consumers

Substances Reported in Calendar Year 2011

Primary Standards: Health-Related Standards

GROUND WATER						
CLARITY	UNITS	MCL	PHG (MCLG)	Range	Average	DRINKING WATER SOURCES
Turbidity	ntu	TT	NA	0.09 - 0.5	0.106	Soil runoff.
INORGANIC CHEMICALS						
Aluminum	ppb	1000	600	ND - 88	8	Erosion of natural deposits; residue from some surface water treatment processes.
Arsenic	ppb	10	0.004	ND - 7.6	2.7	Erosion of natural deposits, glass and electronics production waste.
Barium	ppm	1	2	0.72 - 0.140	0.10	Erosion of natural deposits.
Chromium	ppb	50	100	1.7 - 22	10	Discharge from chrome plating and erosion of natural deposits.
Fluoride	ppm	2	1	0.15 - 0.36	0.19	Erosion of natural deposits.
Lead	ppb	AL= 15	0.2	ND - 0.97	0.14	Erosion of natural deposits.
Nitrate (as N)	ppm	10	10	0.4 - 5.2	2.0	Runoff and leaching from fertilizer use; leaching from septic tanks; erosion of natural deposits.
Perchlorate	ppb	6	6	ND - 4.3	0.39	Perchlorate is an inorganic chemical used in solid rocket propellant, fireworks, explosives, flares, matches, and a variety of industries. It usually gets into drinking water as a result of environmental contamination from historic aerospace or other industrial operations that used or use, store, or dispose of perchlorate and its salts.
RADIOACTIVITY						
Gross Beta Activity	pCi/L	50	0	ND - 5.0	ND	Decay of natural and man-made deposits.
Uranium	pCi/L	20	0.43	1.1 - 3.2	1.7	Erosion of natural deposits.

SURFACE WATER - NBR						
CLARITY	UNITS	MCL	PHG (MCLG)	Highest Detection	Percent in Compliance (<0.5 ntu)	DRINKING WATER SOURCES
Turbidity (a)	ntu	TT	NA	0.08	100%	Soil runoff.
ORGANIC CHEMICALS	UNITS	MCL	PHG (MCLG)	Range	Average	DRINKING WATER SOURCES
Total Trihalomethanes	ppb	80	NA	4.8 - 12	8.9	Byproduct of drinking water disinfection.
INORGANIC CHEMICALS						
Aluminum	ppb	1000	600	21 - 98	48	Erosion of natural deposits; residue from some surface water treatment processes.
Barium	ppm	1000	2000	0.034 - 0.044	0.041	Erosion of natural deposits.
Fluoride	ppm	2	1	0.11 - 0.15	0.13	Erosion of natural deposits.
Nitrate (as N)	ppm	10	10	ND - 1.7	0.9	Runoff and leaching from fertilizer use and septic tanks; erosion of natural deposits.

SURFACE WATER - VWTP						
CLARITY	UNITS	MCL	PHG (MCLG)	Highest Detection	Percent in Compliance (<0.5 ntu)	DRINKING WATER SOURCES
Turbidity (a)	ntu	TT	NA	0.2	100%	Soil runoff.
ORGANIC CHEMICALS	UNITS	MCL	PHG (MCLG)	Range	Average	DRINKING WATER SOURCES
Total Trihalomethanes	ppb	80	none	30	30	Byproduct of drinking water disinfection.
INORGANIC CHEMICALS						
Arsenic	ppb	10	0.004	2	2	Erosion of natural deposits, glass and electronics production waste.
Barium	ppm	1000	2000	0.042	0.042	Erosion of natural deposits.
Fluoride	ppm	2	1	0.077	0.077	Erosion of natural deposits.

HOW TO READ THE TABLES:

The test results are divided into the following tables: Health-Based Primary Standards; Aesthetic-Based Secondary Standards; and Unregulated Constituents.

Monitoring unregulated constituents helps USEPA and DPH to determine where contaminants occur and whether to regulate them. To read the tables, start with the far left column titled Constituent Detected and read across the row. Units express the amount measured. MCL shows the highest amount of constituent allowed. PHG (MCLG) is the goal amount for that constituent, which may be a lower amount than the amount allowed. The Range reports the lowest and highest amounts detected and the Avg is the annual average. Major Sources in Drinking Water describes where the substance usually originates. To better understand the report, use the Legend that defines the terms used.

City of Vacaville 2011 Drinking Water Quality Report to Consumers

City of Vacaville Water Treatment Plant

LEGEND:

MCL (Maximum Contaminant Level): The highest level of a contaminant that is allowed in drinking water, Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.
MCLG (Maximum Contaminant Level Goal): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).
PHG (Public Health Goal): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.
PDWS (Primary Drinking Water Standard): MCLs and MRDLs are set for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.
MRDL (Maximum Residual Disinfectant Level): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
MRDLG (Maximum Residual Disinfectant Level Goal): The level of a drinking water disinfectant below which there is no known or expected risk to health, MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
AL (Regulatory Action Level): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.
TT (Treatment Technique): A required process intended to reduce the level of a contaminant in drinking water.
NA: Not applicable or Not available at this time.
ND: Not Detected.
ntu: Nephelometric Turbidity Units. This is the standard unit for turbidity measurement.
pCi/L: Pico Curies per Liter.
µS/cm: unit of measure for conductance.
ppm: Parts Per Million or Milligrams Per Liter (mg/L). (30 seconds in 1 year)
ppb: Parts Per Billion or Micrograms Per Liter (ug/L). (3 seconds in 100 years).
ton: Total Odor Number.
(a): Range is maximum monthly value; 100% represents the lowest percentage of samples which meet monthly compliance limit of 0.5 ntu. Turbidity is a measure of water cloudiness. It is a good indicator of filtration effectiveness.
(b): This is the State action level for samples collected from inside homes.
(c): The 90th percentile reflects the concentration of lead or copper at which 90% of the samples tested were found to have not exceeded. Household lead and copper results are from 2011.
The next sampling is scheduled for 2014.
(d): Not possible to differentiate between groundwater and surface water source.
(e): Added as required for dental health protection. Standard depends upon temperature.
(f): Compliance is based on a running annual average of samples collected quarterly.
(g): To convert hardness data from ppm to grains per gallon, divide by 17.

DE Filtration Tank

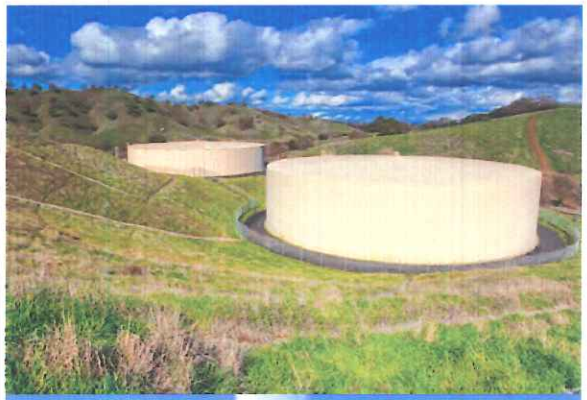
In 2011, one well was reported as having a detectable level of perchlorate, an inorganic chemical used in solid rocket propellant, fireworks, explosives, flares, matches, and a variety of industries. It usually gets into drinking water as a result of environmental contamination from historic aerospace or other industrial operations that used or use, store, or dispose of perchlorate and its salts. Groundwater samples taken prior to 2011 and samples taken in 2012 have been non detect for perchlorate, suggest the one result was a lab error. There is also no source for "rocket fuel" in the area of the affected well. We will continue to monitor for perchlorate at this well until the State is assured that there is no risk to our customers from this compound. Perchlorate, in general, has been shown to interfere with the functioning of thyroid gland, leading to adverse affects associated with inadequate hormone levels. Thyroid hormones are needed for normal prenatal growth and development of the fetus, as well as for normal growth and development in the infant and child. In adults, thyroid hormones are needed for normal metabolism and mental function.

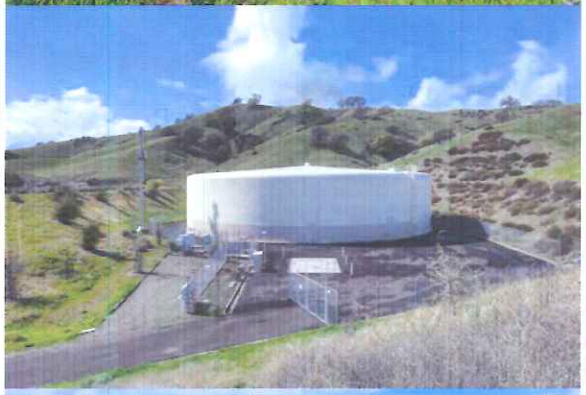
North Bay Regional Water Treatment Plant

City of Vacaville 2011 Drinking Water Quality Report to Consumers

Secondary Standards Aesthetic - Related

			GROUND WATER		SURFACE WATER NBR		SURFACE WATER VWTP	
SUBSTANCE	UNITS	MCL	Range	Average	Range	Average	Range	Average
Aluminum	ppb	200	ND - 88	8	21 - 98	48	ND	ND
Chloride	ppm	250	8 - 37	18	13 - 27	19	7	7
Copper	ppb	1	ND - 24	2	ND	ND	3	3
Color	units	15	ND	ND	ND	ND	5	5
Iron	ppb	300	ND - 89	12	ND	ND	ND	ND
Manganese	ppb	50	ND - 3.8	1	ND	ND	3	3
Odor - Threshold	ton	3	ND - 1	0.5	1 - 2	2	1	1
Sulfate	ppm	250	25 - 68	41	49 - 56	52	22	22
Specific Conductance	µS/cm	1600	460 - 820	588	324 - 438	383	340	340
Total Dissolved Solids	ppm	1000	290 - 540	367	192 - 243	222	200	200
Additional Substances Analyzed								
Alkalinity	ppm	No Std	200 - 330	232	92 - 166	137	150	150
Boron	ppb	AL = 1000	110 - 280	190	20 - 270	167	180	180
Calcium	ppm	No Std	13 - 81	43	15 - 28	22	18	18
Hardness (g)	ppm	No Std	81 - 310	190	88 - 191	153	170	170
Magnesium	ppm	No Std	12 - 27	20	12 - 30	24	31	31
pH	units	No Std	7.3 - 8.1	7.7	7.8 - 8.2	8.0	8.4	8.4
Potassium	ppm	No Std	1.5 - 5.6	3.5	1.5 - 2.3	1.8	1.2	1.2
Sodium	ppm	No Std	41 - 75	55	23 - 48	34	10	10
Vanadium	ppb	AL = 50	6 - 27	17	ND - 3.5	1.7	3	3
Molybdenum	ppb	No Std	ND - 3	0.5	ND - 1.4	0.4	ND	ND



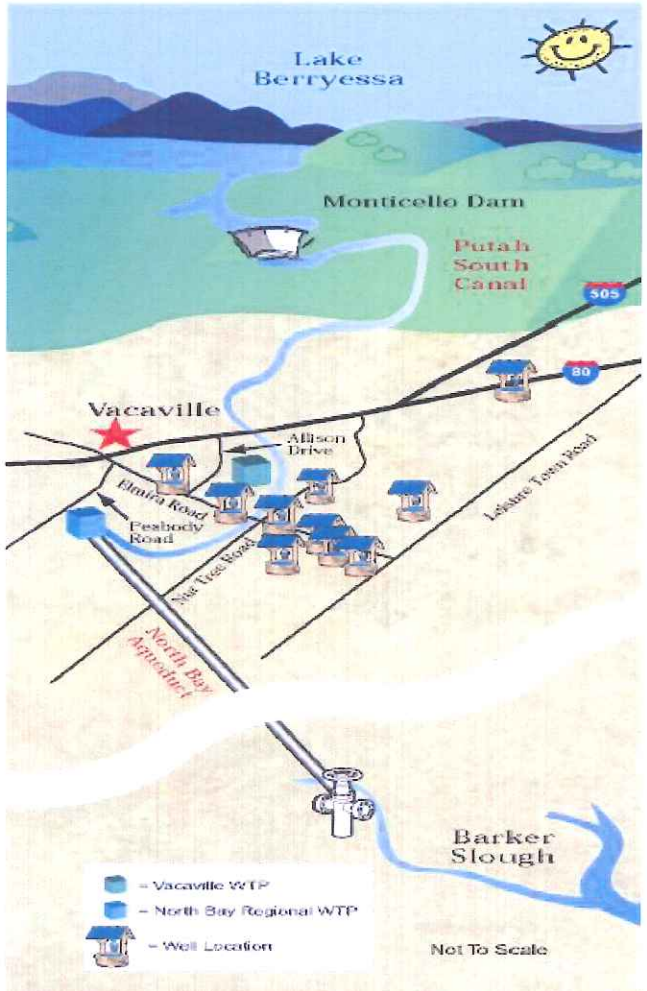


Disinfection and Disinfection By-Products (DBP)

SUBSTANCE	UNITS	MCL or MRDL	MCLG or MRDLG	LEVEL DETECTED			DRINKING WATER SOURCES
Disinfectants and Disinfection By-Products (DBP)				Avg	Max	Min	
Total Trihalomethanes (d)(f)	ppb	80	NA	20	67	ND	By-product of drinking water chlorination.
Halo-Acetic Acids (d)(f)	ppb	60	NA	7.9	29	ND	By-product of drinking water chlorination.
Chlorine	ppm	4	4	0.74	1.5	0.02	Drinking water disinfectant added for treatment.
Bromate	ppb	10	0	1.5	3.5	ND	Drinking water disinfectant added for treatment.
Control of DBP Precursors (TOC)	mg/L	TT	-	1.4	2.6	ND	Various natural and manmade sources.

Primary Constituents Reported in the distribution system

SUBSTANCE	UNITS	MCL	PHG (MCLG)	RANGE	DRINKING WATER SOURCES
Lead (b)(c)	ppb	AL = 15	0.2	2.5 ppb reflect the 90th percentile. Of the 31 samples analyzed, none exceeded the action level. Data is from the last required sampling in September 2011.	Erosion of natural deposits; Internal corrosion of household water plumbing systems.
Copper (b)(c)	ppm	AL = 1.3	0.30	0.20 ppm reflect the 90th percentile. Of the 31 samples analyzed, none exceeded the action level. Data is from the last required sampling in September 2011.	
Fluoride (d)(e)	ppm	0.7 - 1.3	0.8	Distribution system-wide highest monthly average = 0.8 ppm with a minimum of 0.4 ppm and a maximum of 1.0 ppm.	Erosion of natural deposits; Water additive that promotes strong teeth.
Total Coliform Bacteria (Total Coliform Rule)	MPN/ 100 mL	5%	(0)	Distribution system-wide highest monthly value = 0 % (1352 samples taken in 2011.)	Naturally present in the environment.



HEALTH RELATED INFORMATION

Precautions for people with weakened immune systems:

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised people such as those with cancer undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA and Center for Disease Control guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants can be obtained by calling USEPA's Safe Drinking Water Hotline (800-426-4791) or visiting the web site at www.epa.gov/.

Este informe contiene información muy importante sobre su aqua potable. Tradúzcalo o hable con alguien que lo entienda bien..

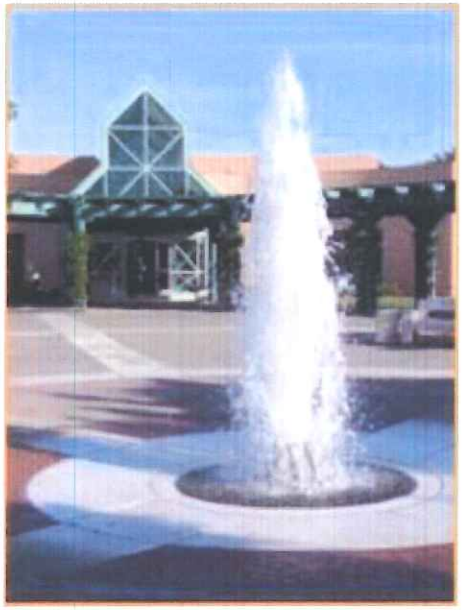
2012 Drinking Water Quality Report to Consumers

City of Vacaville
650 Merchant Street
Vacaville, Ca 95688
Phone 707-469-6400

CITY OF VACAVILLE

Water Quality Report to Consumers

2012



REFERENCE 3C

HOW TO READ THE FOLLOWING TABLES: The test results are divided into the following tables: Health-Based Primary Standards; Aesthetic-Based Secondary Standards; and Unregulated Constituents. Monitoring unregulated constituents helps USEPA and DPH to determine where contaminants occur and whether to regulate them. To read the tables, start with the far left column titled Substance and read across the row. Units express the amount measured. MCL shows the highest amount of the substance allowed. PHG (MCLG) is the goal amount for that substance, which may be a lower amount than the amount allowed. The Range reports the lowest and highest amounts detected and the Average is the annual average. Drinking Water Sources describes where the substance usually originates. To better understand the report, use the Legend that defines the terms used.

Primary Standards: Health-Related Standards	Substances Reported in Calendar Year 2012

					GROUNDWATER		
SUBSTANCE	UNITS	DATE OF LAST SAMPLE	MCL	PHG (MCLG)	Range	Average	DRINKING WATER SOURCES
CLARITY							
Turbidity	ntu	2011	tt	na	0.09 - 0.5	0.16	Soil runoff.
INORGANIC CHEMICALS							
Aluminum	ppb	2011	1000	600	nd - 88	8	Erosion of natural deposits; residue from some surface water treatment processes.
Arsenic	ppb	2012	10	0.004	nd - 7.7	2.7	Erosion of natural deposits; glass and electronics production waste.
Barium	ppm	2011	1	2	0.07 - 0.14	0.10	Erosion of natural deposits.
Chromium	ppb	2011	50	100	1.7 - 22	10	Discharge from chrome plating and erosion of natural deposits.
Fluoride	ppm	2012	2	1	0.16 - 0.38	0.21	Erosion of natural deposits.
Lead	ppb	2011	al = 15	2	nd - 0.97	0.14	Erosion of natural deposits.
Nitrate (as N)	ppm	2012	10	10	0.4 - 5.2	2.0	Runoff and leaching from fertilizer use; leaching from septic tanks; erosion of natural
RADIOACTIVITY							
Gross Beta Activity	pCi/L	2011	50	0	nd - 5.0	nd	Decay of natural and man-made deposits
Uranium	pCi/L	2011	20	0.43	1.1 - 3.2	1.7	Erosion of natural deposits.

					SURFACE WATER -NBR		
SUBSTANCE	UNITS	DATE OF LAST SAMPLE	MCL	PHG (MCLG)	Highest Detection	Percent in Compliance (<0.5 ntu)	DRINKING WATER SOURCES
CLARITY							
Turbidity (a)	ntu	2012	tt	na	0.08	100%	Soil runoff.
SUBSTANCE	UNITS	DATE OF LAST SAMPLE	MCL	PHG (MCLG)	Range	Average	DRINKING WATER SOURCES
Regulated Organic Chemicals							
Total Trihalomethanes	ppb	2012	80	na	4.8 - 12	8.9	Byproduct of drinking water disinfection.
INORGANIC CHEMICALS							
Aluminum	ppb	2012	1000	600	nd - 25	8	Erosion of natural deposits; residue from some surface water treatment processes.
Barium	ppm	2012	1	2	nd - 0.03	0.02	Erosion of natural deposits.
Fluoride	ppm	2012	2	1	nd - 0.2	0.12	Erosion of natural deposits.
Nitrate (as N)	ppm	2012	10	10	nd - 1.2	0.7	Runoff and leaching from fertilizer use; leaching from septic tanks; erosion of natural deposits.

					SURFACE WATER - WWTP		
SUBSTANCE	UNITS	DATE OF LAST SAMPLE	MCL	PHG (MCLG)	Highest Detection	Percent in Compliance (<0.5 ntu)	DRINKING WATER SOURCES
CLARITY							
Turbidity (a)	ntu	2012	tt	na	0.2	100%	Soil runoff.
SUBSTANCE	UNITS	DATE OF LAST SAMPLE	MCL	PHG (MCLG)	Range	Average	DRINKING WATER SOURCES
Regulated Organic Chemicals							
Total Trihalomethanes	ppb	2012	80	none	30	30	Byproduct of drinking water disinfection.
INORGANIC CHEMICALS							
Arsenic	ppb	2012	10	0.004	2	2	Erosion of natural deposits; glass and electronics production waste.
Barium	ppm	2012	1	2	0.04	0.04	Erosion of natural deposits.
Chromium	ppb	2012	50	100	3	3	Discharge from chrome plating and erosion of natural deposits.
Fluoride	ppm	2012	2	1	0.08	0.08	Erosion of natural deposits.

FOOTNOTES:

(a): Range is maximum monthly value; 100% represents the lowest percentage of samples which meet monthly compliance limit of 0.5 ntu. Turbidity is a measure of water cloudiness. It is a good indicator of filtration effectiveness.

(b): This is the State action level for samples collected from inside homes.

(c): The 90th percentile reflects the concentration of lead or copper at which 90% of the samples tested were found to have not exceeded. Household lead and copper results are from 2011. The next sampling is scheduled for 2014.

(d): Not possible to differentiate water source.

(e): Added as required for dental health protection. Standard depends upon temperature.

(f): Compliance is based on a running annual average of samples collected quarterly.

(g): To convert hardness data from ppm to grains per gallon, divide by 17.

LEGEND

MCL (Maximum Contaminant Level): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

MCLG (Maximum Contaminant Level Goal): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the USEPA.

PHG (Public Health Goal): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the Cal EPA.

PDWS (Primary Drinking Water Standard): MCLs and MRDLs are set for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

MRDL (Maximum Residual Disinfectant Level): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG (Maximum Residual Disinfectant Level Goal): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

AL (Regulatory Action Level): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

tt (Treatment Technique): A required process intended to reduce the level of a contaminant in drinking water.

na: Not applicable or Not available

nd: Not Detected.

ntu: Nephelometric Turbidity Units. This is the standard unit for turbidity.

pCi/L: Pico Curies per Liter.

uS/cm: unit of measure for conductance.

ppm: Parts Per Million or Milligrams Per Liter (mg/L). (30 seconds in 1 year)

ppb: Parts Per Billion or Micrograms Per Liter (ug/L). (3 seconds in 100 years).

ton: Total Odor Number.

DISTRIBUTION SYSTEM INFORMATION

SUBSTANCE	UNITS	MCL	PHG (MCLG)	RANGE	DRINKING WATER SOURCES
Lead (b) (c)	ppb	al = 15	0.2	2.5 ppb reflect the 90th percentile. Of the 31 samples analyzed, none exceeded the action level. Data is from the last required sampling of September of 2011	Erosion of natural deposits; Internal corrosion of household water plumbing systems
Copper (b) (c)	ppm	al = 1.3	0.30	0.20 ppm reflect the 90th percentile. Of the 31 samples analyzed, none exceeded the action level. Data is from the last required sampling of September of 2011.	
Fluoride (d) (e)	ppm	0.7 - 1.3	0.8	Distribution system-wide monthly average = 0.8 ppm with a minimum of 0.6 ppm and a maximum of 1.0 ppm	Erosion of natural deposits; Water additive that promotes strong teeth
Total Coliform Bacteria (Total Coliform Rule)	MPN/ 100 mL	5%	(0)	Distribution system-wide highest monthly value = 0% (1352 samples taken in 2012.)	Naturally present in the environment
SUBSTANCE	UNITS	MCL or MRDL	MCLG or MRDLG	LEVEL DETECTED	DRINKING WATER SOURCES
Chlorine	ppm	4	4	Average = 0.78 ppm Minimum = 0.02 Maximum = 1.4 ppm	Drinking water disinfectant added for treatment
Control of DBP Precursors (TOC)	ppm	tt	-	Average = 2.0 ppm Minimum = 1.5 ppm Maximum = 2.6	Various natural and manmade sources

DISINFECTION BY-PRODUCTS

SUBSTANCE / Units	MCL	PHG (MCLG)	Average	Range	Sample Date	Violation	Drinking Water Sources
Total Trihalomethanes / ppb (d) (f)	80	na	21	5 - 54	2012	NO	By-product of drinking water chlorination.
Halo-Acetic Acids / ppb (d) (f)	60	na	9	1 - 33	2012	NO	

Secondary Standards: Aesthetic-Related			GROUNDWATER		SURFACE WATER NBR		SURFACE WATER WWTP		
SUBSTANCE	UNITS	MCL	Range	Average	Range	Average	Range	Average	DRINKING WATER SOURCES
Aluminum	ppb	200	nd - 88	8	nd - 25	8	nd	nd	Erosion of natural deposits; residue from some surface water treatment processes
Chloride	ppm	250	8 - 37	16	16 - 20	18	8	8	Runoff/leaching from natural deposits; seawater influence
Copper	ppb	1000	nd - 24	3	nd	nd	5	5	Internal corrosion of household plumbing; erosion of natural deposits; leaching from wood preservatives
Color	units	15	nd	nd	nd	nd	nd	nd	Naturally-occurring organic materials
Foaming Agents (MBAS)	ppb	500	nd	nd	nd	nd	nd	nd	Municipal and industrial waste discharges
Iron	ppb	300	nd - 89	12	nd	nd	nd	nd	Leaching from natural deposits; industrial wastes
Manganese	ppb	50	nd - 4.1	0.7	nd	nd	2	2	Leaching from natural deposits.
Odor Threshold	ton	3	nd - 1	0.3	1 - 2	2	1	1	Naturally-occurring organic materials
Silver	ppb	100	nd	nd	nd - 16	6	nd	nd	Industrial discharges
Sulfate	ppm	250	35 - 68	41	32 - 56	43	24	24	Runoff/leaching from natural deposits; seawater influence
Specific Conductance	uS/cm	1600	460 - 820	596	270 - 410	328	370	370	Substances that form ions when in water; industrial wastes
Total Dissolved Solids	ppm	1000	299 - 540	383	171 - 245	205	190	190	Runoff/leaching from natural deposits
Zinc	ppm	5	nd	nd	nd	nd	nd	nd	Runoff/leaching from natural deposits; industrial wastes
Additional Substances Analyzed									
Alkalinity	ppm	No Std	200 - 330	236	77 - 145	114	190	190	Naturally-occurring due to carbonates and bicarbonates dissolved in water
Boron	ppb	al = 1000	110 - 230	160	120 - 140	127	100	100	Leaching from natural deposits
Calcium	ppm	No Std	13 - 61	43	14 - 20	18	18	18	Contributes to hardness; leaching from natural deposits
Hardness (g)	ppm	No Std	81 - 310	190	77 - 150	106	180	180	Measure of Calcium and Magnesium dissolved in water.
Magnesium	ppm	No Std	10 - 27	20	10 - 17	16	32	32	Contributes to hardness; leaching from natural deposits
pH	units	No Std	7.3 - 8.1	7.7	8.1 - 8.4	8.2	8.5	8.5	Naturally occurring; range should be from 6.5 to 8.5 in drinking water.
Potassium	ppm	No Std	1.5 - 5.6	4.5	1.7 - 2.1	1.9	1.2	1.2	Leaching from natural deposits
Sodium	ppm	No Std	41 - 75	55	30 - 39	33	11	11	Leaching from natural deposits
Vanadium	ppb	al = 50	6 - 27	14	nd - 4.2	2.8	5	5	Leaching from natural deposits; industrial wastes
Molybdenum	ppb	No Std	nd - 3	0.4	nd	nd	nd	nd	Leaching from natural deposits; industrial wastes

City of Vacaville (the City) wants you, our customers to know that your water system has met all water quality standards and is a safe and reliable supply. These standards are established by the U.S. Environmental Protection Agency (USEPA) and the California State Department of Public Health (DPH). In 2012 the City distributed over 5.5 billion gallons of drinking water. This water was subjected to extensive testing, not only for regulated contaminants, but non-regulated. More than 7,000 analyses were performed on water samples in 2012.

In order to ensure that tap water is safe to drink, the USEPA and the DPH prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. DPH regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants doesn't necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at (800) 426-4791,or visit the web site at http://www.epa.gov/safewater/. If you have further questions, please contact the City Water Quality Lab Supervisor, Mindy Boele, by phone at (707) 469-6400 or by email at mboele@cityofvacaville.com.

Protect Your Water Supply

Polluted storm water potentially affects drinking water sources, which can affect public health and increase drinking water treatment costs. Please help protect your water supply by controlling household, landscaping and automotive products that contain toxic chemicals. Reduce the use of toxic chemicals wherever possible (including fertilizers and pesticides) and be sure to properly recycle or dispose of waste. Everything that goes down a storm drain or sewer may potentially affect your local water. Never dispose of household, landscaping or automotive products and chemicals down the storm drain or in the sewer.

Keep the Lead out of Drinking Water

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The City is responsible for providing high quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead

Lake Berryessa "Glory Hole"

City Groundwater Well

SOURCE WATER ASSESSMENTS AND VULNERABILITY SUMMARIES

A Source Water Assessment evaluates the quality of water that is used in a community drinking water supply. It is also used to determine the Potential Contributing Activities (PCAs) that occur within and nearby a source water supply. The PCAs are then compiled into a Vulnerability Summary report. The latest Summary report for the Sacramento Delta, including the Barker Slough North Bay Aqueduct (NBA), was updated in 2012. The source was considered to be most vulnerable to animal grazing activities, urban and agricultural runoff, recreational use and seawater intrusion.

The cities treating NBA water, in conjunction with the Solano County Water Agency, have implemented watershed management practices to improve water quality and reduce the significance of the potential contaminant sources. The latest Summary report for Putah South Canal (PSC) was completed in 2006. The results of the assessment survey indicated that PSC is most vulnerable to illegal activities/ unauthorized dumping and herbicide application. Management measures along the canal have been implemented that mitigate the risk for each of these PCAs.

The Summaries for Vacaville's groundwater wells were performed in 2002, 2003, and 2005. The wells are considered most vulnerable to automobile gas stations, chemical and petroleum processing and storage, dry cleaners, septic systems, sewer collection systems, agricultural drainage and agricultural and irrigation wells. The wells offer various levels of protection from PCAs due to factors such as the aquifer, deep water table intakes, well construction features and physical barriers. A copy of the Source Water Assessments and Vulnerability Summaries can be obtained through the California DPH, Drinking Water Field Operations Branch, San Francisco District Office, 850 Marina Bay Parkway, Bldg P, 2nd Floor, Richmond, California 94804. You may request that a summary be sent to you by contacting Betty Graham, District Engineer, CDPH, at (510) 620-3474.

ARSENIC IN DRINKING WATER: Vacaville Meets the Limit

While arsenic levels in your drinking water are less than the current USEPA standard of 10 ppb, the groundwater does contain low levels of arsenic. These results are from samples taken in 2011 and 2012. The standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The USEPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

CONTAMINANTS THAT MAY BE PRESENT IN SOURCE WATER:

- Microbial contaminants, such as viruses and bacteria that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife;
- Inorganic contaminants, such as salts and metals, that can be naturally-occurring or result from urban storm-water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming;
- Pesticides and herbicides that may come from a variety of sources such as agriculture, urban storm-water runoff, and residential uses;
- Organic chemical contaminants, including synthetic and volatile organic chemicals, that are by-products of industrial processes and petroleum production and can also come from gas stations, urban storm-water runoff, agricultural application, and septic systems; and
- Radioactive contaminants that can be naturally-occurring or be the result of oil and gas production and mining activities.

SOURCE WATER: VACAVILLE

Lake Berryessa surface water, conveyed through Putah South Canal (PSC), provided 31% of the City's total consumption of water in 2012, and Sacramento Delta surface water, from the North Bay Aqueduct (NBA), provided an additional 39%. Groundwater from the 11 deep wells made up the balance (30%) of our water useage.

McMurtry Reservoir

Water Plant

POLICY ON NONDISCRIMINATION ON THE BASIS OF DISABILITY

In accordance with the requirements of Title II of the Americans with Disabilities Act of 1990, the City of Vacaville does not discriminate against qualified individuals with disabilities on the basis of disability in the City's services, programs or activities, or employment. Information, comments, requests for accommodations or barrier removal, and/or complaints concerning the accessibility of City programs, services or activities to persons with disabilities should be directed to the City's ADA Coordinator, 650 Merchant Street, 469-6578, 449-5162 (TTY), or ada@cityofvacaville.com.

REFERENCE 4

Association of
California Water Agencies
Since 1910
Leadership • Advocacy • Information • Service

February 2013

Suggested Guidelines for Preparation of Required Reports on PUBLIC HEALTH GOALS (PHGs) to satisfy requirements of California Health and Safety Code Section 116470(b)

Background

Public water systems serving more than 10,000 service connections must prepare a brief, written report in plain language by July 1, 2013 that gives information on the "detection" of any contaminants above the Public Health Goals (PHGs) published by the state Office of Environmental Health Hazard Assessment (OEHHA). The report must also list the "detection" of any contaminant above the Maximum Contaminant Level Goals (MCLGs) set by United States Environmental Protection Agency (USEPA) for all other contaminants until such time as OEHHA has published PHGs for those contaminants.

It is emphasized that the report only needs to provide information on the very limited number of contaminants that a water system has found at a level exceeding a PHG or a MCLG.

The purpose of the legislation requiring these reports was to provide consumers with information on levels of contaminants even below the enforceable mandatory Maximum Contaminant Levels (MCLs) so they would be aware of whatever risks might be posed by the presence of these contaminants at levels below the MCLs. Additionally, each water system must provide an estimate of the cost to reduce the contaminant(s) to the PHG regardless of how minimal the risk might be.

The following should be considered when preparing the mandated reports:

1. The USEPA and the California Department of Public Health (CDPH) establish MCLs at very conservative levels to provide protection to consumers against all but very low to negligible risk. In other words, MCLs are the regulatory definition of what is "safe." Adopted MCLs are still the criteria for being in compliance, not those proposed or possible in the future, and certainly not MCLGs or PHGs.

2. MCLGs and PHGs are often set at very low levels depending on the established health risk, and in the case of USEPA, MCLGs are also set at zero for some contaminants. Determination of health risk at these low levels is theoretical based on risk assessments with multiple assumptions and mathematical extrapolations. Many contaminants are considered to be carcinogenic and USEPA's policy is to set the applicable MCLGs at zero because they consider no amount of these contaminants to be without risk. It is understood by all that zero is an unattainable goal and cannot be measured by the practically available analytical methods. Note that by regulation, OEHHA cannot set a PHG at zero and must calculate a numerical level to address risk.

3. PHGs and MCLGs are not enforceable. The Best Available Technology (BAT) to reach such low levels has not been defined and may not realistically be available. Accurate cost estimates are difficult, if not impossible, and are highly speculative and theoretical. Therefore, they have limited value and may not warrant significant investment of agency time and money.

These reports are unique to California. They are required in addition to the extensive public reporting of water quality information that California water utilities have been doing for many years and in addition to the federally mandated Consumer Confidence Reports (CCRs). Hence, it should be kept in mind that IN ADDITION to this required report, each utility will continue reporting ANNUALLY in great depth on the quality of the water it serves.

The guidance herein is intended to assist water suppliers in completing the required reports in a responsible manner without expending excessive amounts of resources that are better used to comply with the many regulatory mandates designed to ensure safe drinking water.

Guidance on preparing these reports is needed because the legislative language does not spell out all of the detailed answers to questions that arise. Neither the CDPH nor OEHHA have issued any guidelines regarding the report. In fact, while OEHHA has a mandate to determine and provide information on "numerical health risk," they otherwise have no involvement or authority regarding the report.

The CDPH Division of Drinking Water and Environmental Management, as the primary enforcing agency of all provisions of the Health and Safety Code relative to drinking water systems, has the authority to ensure that public water systems comply with the report requirement. CDPH requests that utilities report in writing as to how they have complied with the fundamental requirements of this section, which are:

1) Prepare a brief written report,
2) Hold a public hearing (meeting), and

3) Notify CDPH that the meeting was held and the report is available.

Detailed Guidelines:

I. Who must prepare a PHG report?

The California Health and Safety (H&S) Code, Section 116470(b) is clear that a system ONLY needs to do a report IF it has at least 10,000 service connections AND IF it exceeds one or more PHGs or MCLGs. Also, a public hearing is NOT required IF a report does not have to be prepared.

Some utilities that do NOT have to do the report may choose to submit an information item to their governing board advising them that no report is required.

This report is required every three years.

II. Wholesalers (<10,000 service connections) are NOT required to do a PHG report.

CDPH has clarified that wholesalers who do not directly serve more than 10,000 service connections are not required to meet the PHG report requirements of California H&S Code, Section 116470(b).

III. Timing, Notification, Meetings

A. Timing and Meeting: It is required that the report be prepared by July 1, 2013. A public hearing, which can be held as part of any regularly scheduled meeting, should be held sometime after July 1 and prior to reporting to CDPH. CDPH has indicated that the public hearing "should be held within a reasonable time after the report's completion" so the information is current. The purpose of the hearing is to "accept and respond to" public comment. The governing board or council of public water agencies would also likely approve the staff report at that time. This would represent endorsement by the board of the part of the report where any action (or no action) would be proposed regarding reduction of contaminants to levels lower than required for compliance with MCLs.

B. Notification: There is no requirement to send a copy of the report to the public. Public agencies must "notice" public hearings so this hearing would be subject to the normal notice requirements (i.e., number of days advance, publishing in appropriate newspaper, etc.) The notice would appropriately indicate the report is the subject of the hearing and indicate it is available for the public to review or to get a copy upon request.

(NOTE: Investor owned utilities will likely have to schedule a special "meeting" since they are not subject to the same meeting notice requirements and may not have any authority to hold a "public hearing" per se. Their notification of the public could however be similar to public agencies, i.e., publication of legal notice in newspaper of general circulation.)

C. Submission of Reports: CDPH does not specifically require that a copy of the report be submitted to them.

IV. Interpretations

A. What contaminants must be covered?

A table of relevant current PHGs, MCLGs, MCLs, and Detection Limits for purposes of Reporting (DLRs) is attached to this guidance as Attachment No. 1.

1. Only contaminants that **have an existing MCL** AND were "detected" at a level that "exceeds" the PHG or, where there is no PHG, the Federal MCLG, need to be included in the report. (See guidance below on "detected" and "exceed")

2. All contaminants that, **as of December 31, 2012**, have Primary Drinking Water Standards (PDWS) set by California **AND** have an equivalent PHG or a MCLG. This includes chemical, microbiological and radiological constituents. PDWS may be either MCLs or Treatment Techniques (TT). For example, the Surface Water Treatment Rule (SWTR) is a TT for the following contaminants: *Giardia lamblia*, viruses, *Cryptosporidium*, *Legionella* and heterotrophic bacteria (HPC). A TT is set when it is not possible to reliably analyze for the contaminant of concern (the SWTR) or when it is not feasible or appropriate to set a numerical standard (the Lead & Copper Rule).

3. It does NOT include contaminants such as radon for which USEPA has considered adopting an MCL nor does it include any contaminants CDPH plans to regulate in the future like Chromium VI.

   It does NOT include contaminants for which there is no final PHG or MCLG as of December 31, 2012 nor does it include any secondary MCLs (i.e., TDS, SO_4, Na, etc).

B. What data are to be used for the report due by July 1, 2013?

1. It is recommended that the data used should be from the 3 consecutive calendar years prior to the year the report is prepared. For example, the 2013 report would be based on the analytical data from samples taken in 2010, 2011, and 2012. The data should be the same as that used by the drinking water agency in determining compliance with CDPH requirements.

2. For utilities that purchase water from another agency or from a wholesaler, it is suggested that the same guidance or ground rules be followed as for the CCRs. If the only source for a retail system is treated water from a wholesaler and that water contains a constituent above a PHG or MCLG, the retailer should use its own distribution system monitoring data. For systems with both its own sources of water and purchased water, the retailer should evaluate its own distribution system compliance monitoring and compare the annual average value with the PHG or MCLG.

C. What do the terms "detect" and "exceed" mean in the context of the required report?

1. Keep in mind that there are no regulations that relate to "meeting" or "complying with" PHGs. The logical approach seems to be to use the same procedures and requirements that the California Title 22 Regulations specify for determining compliance with MCLs. For example, if Title 22 or CDPH guidance specifies that the average of a group of samples be compared to the MCL for compliance purposes, the same averaging should be used to compare to the PHG or MCLG. For most constituents (coliform is an exception), compliance with MCLs is measured at the "point of entry" to the distribution system. This means that, for the most part, the analytical results for each well must be evaluated separately and compared to the MCLG or PHG. If wells are blended or treated before delivery to the system, the judgment as to whether there was a "detection exceeding the MCLG or PHG" should be based on the "point of entry" data just as for compliance with MCLs.

2. Be sure to report the PHG (or MCLG) as a number equal to or greater than 1.0 as specified in the State Consumer Confidence Report Guidance for Water Suppliers. It is recommended that all data be converted to match CCR data. Attachment No. 1 concentration numbers are given as mg/L, unless otherwise noted.

3. Keep in mind that if a utility determines that a constituent has been found at a level exceeding the PHG or MCLG, a cost estimate is mandated. A utility would ordinarily be required to perform a cost estimate only if it is clear that the MCL has been clearly exceeded, not just momentarily, or on one sample. In the same way, only when the PHG/MCLG level is clearly exceeded should a cost estimate be calculated and reported.

4. Significant figures, analytical detection limits, reporting limits, and different methods of determining compliance, all affect the assessment of which constituents were "detected" above the PHG or the MCLG.

5. Results that are reported below the State regulatory Detection Limit for Purposes of Reporting (DLR - See Title 22, CCR, Sections 64432 & 64445.1 and other CDPH guidance on compliance reporting) should be treated as 0 (zero) which is accepted CDPH practice. USEPA also recommends treating ND as zero.

6. As in all cases of reporting results to the state, the results of analyses should be rounded to reflect the appropriate number of significant figures. (EXAMPLE: For coliform bacteria, the MCLG is 0% samples positive per month which indicates one significant figure. So, if during 2011, a system had a positive sample but the percentage of samples positive for the month was <0.49%, this could be rounded to one significant figure, as the MCLG is expressed, so it would be rounded to 0%.) (SECOND EXAMPLE: For a constituent like PCBs where the MCL is 0.5 ppb and the DLR is 0.5 ppb, how do you determine if you exceeded the MCLG of "zero"? Webster defines "zero" as "having no measurable or otherwise determinable value" which in effect is the DLR. So for PCBs, if the average of results for a given well is less than the DLR, the value would be reported as "zero". Note that by regulation OEHHA cannot set a PHG at zero and must calculate a numerical level to address risk.)

7. In averaging the results for a constituent over a specified period during which some of the data is less than the DLR, the average value obtained should be rounded to the appropriate significant figure before comparing to the PHG or MCLG. (EXAMPLE: If a well were sampled for TCE and 0.6 ppb was found and the resample showed 0.6 ppb, it would constitute a confirmed positive. But if 3 additional compliance samples were taken from the well and all had less than 0.5 ppb, which is the DLR, then averaging the 5 samples would give an average of 0.24 ppb, which would

be rounded to zero. So the average from the well does not exceed the PHG of 0.8 and no cost estimate would be needed for this well.)

D. What does the term "best available technology" (BAT) mean as used in this portion of the law?

1. While a specific definition of the term is not in the State Health & Safety Code, the accepted meaning in all other sections is that it refers to a technology to achieve compliance with MCLs. In fact, where "best available technology" is listed or explained (Sections 64447, 64447.2 & 64447.4), the usage is "for achieving compliance with the MCLs." This is also true for BAT specified in federal regulations.

2. However, in Section 116470(b)(4), the term refers to "BAT," if any is then available on a commercial basis, to remove or reduce the concentration of the contaminant. Specifically, (b)(5) requires cost estimates of using the technology described in (b)(4) to "reduce the contaminant...to a level at or below the" PHG (or MCLG).

3. Obviously, where MCLGs are set at zero, there may not be commercially available technology to reach a non-detectable level. This should be clearly stated in the report. Since there is little data readily available to "estimate" cost of treatment to achieve absolute zero levels, rough estimates of "BAT" as defined in law might be used with a clearly written caveat that use of this "BAT" may still not achieve the PHG or MCLG and the costs may be significantly higher to do so.

E. How should the report deal with coliform?

The United States Environmental Protection Agency has revised the 1989 Total Coliform Rule (TCR). The Revised Total Coliform Rule (RTCR) offers a meaningful opportunity for greater public health protection beyond the 1989 TCR. The 1989 TCR provisions (listed below) remain effective until March 31, 2016. PWSs and primacy agencies must comply with the requirements of the RTCR beginning April 1, 2016. As such, ACWA will provide information on the new requirements in the 2016 PHG Triennial Report Guidance.

TCR Provisions still applicable until April 1, 2016:

1. Keep in mind that the MCL is a monthly percent of positive samples (not to exceed 5%) and no actual numbers of coliform are determined or are required to be determined. The MCLG of zero (0) is therefore appropriately interpreted as zero percent of samples per month, NOT

zero samples positive. (For example, if the system did not exceed 0.5% positive samples in any month, the system would not exceed the MCLG of 0 because anything less than 0.5% would be rounded down to 0, which is consistent with the significant figure of the MCLG.)

2. If it is determined that the system has exceeded the MCLG of zero % for coliform bacteria, the following factors are pertinent to deciding what action, if any, is appropriate to consider and estimate costs for:

   a. Exceeding zero % coliform bacteria in any month, in and of itself, would not normally constitute the need for any treatment or action;
   b. There is no action that could be taken that with any certainty could ensure that the system would always have 0% coliform every single month;
   c. The "best available technology" (to meet the MCL, not the MCLG) is specified by CDPH in Title 22, CCR, Section 64447 and for the most part is already followed by many systems;
   d. The one single action that would most likely decrease the possibility of a system having zero % positive coliform would be to significantly increase the chlorine disinfectant residual. This would likely result in increased Disinfection By-Products (DBPs) which have adverse health consequences. This focuses on the risk-tradeoff issue – protection from acute risks versus potential harm from chronic risks. Additionally there are limits to the amount of disinfectant residual allowed in the distribution system maximum residual disinfectant levels (MRDLs) as established by the Disinfectants and Disinfection Byproducts Rule (D/DBPR).
   e. Utilities should point out the positive, proactive steps they take to prevent coliform contamination in the distribution system including such steps as preventive maintenance, main flushing, special monitoring, residual maintenance and testing, cross-connection control, etc.

F. How should the report handle the MCLGs of zero for *Giardia lamblia*, *Cryptosporidium*, *Legionella* and viruses?

1. The MCL for pathogenic micro-organisms is a TT (i.e., the SWTR). No monitoring is mandated for the organisms because there are no standardized methods for testing or the analyses are not timely (like virus testing – 30 days) to provide public health protection.

2. For these reasons, since the intent of the TT (SWTR) is to protect against these pathogens, it can properly be assumed that if the SWTR is met, that

the utility has met the MCLG because there is no uniform way to assess possible pathogen levels.

3. For utilities doing voluntary monitoring of pathogens (such as through the ICR, although most ICR pathogen monitoring is of raw not treated water), the results are appropriately considered research or for operational purposes, and not for compliance purposes.

G. How should the report deal with Lead and Copper?

1. Any lead or copper values below the respective DLR should be reported as zero.

2. For lead from at the tap monitoring, if the 90 percentile lead value is ND or <0.005 mg/l, then you should assume you do not exceed the lead MCLG of zero.

3. For copper from at the tap monitoring, if the 90 percentile copper value is not above 300 ppb, then you have not exceeded the copper PHG.

4. While not precisely stated in the regulations, best available technology for Lead and Copper compliance is a TT (in lieu of MCLs) of "optimized corrosion control." For larger systems with >10,000 service connections, this depends on a series of steps involving sampling, reports, studies, etc. If a system meets the requirements of having optimized corrosion control, but still has a 90 percentile lead or copper value above the PHGs, it is not clear what additional steps could be considered, particularly without causing other potential water quality problems. It may be appropriate to explain this in a straight-forward manner rather than putting in "hypothetical" cost figures.

H. Must the report deal with Total Trihalomethanes (TTHMs) or Haloacetic Acids?

No. MCLG/PHG exceedances must be reported only for those contaminants that have a primary drinking water standard in place and an associated MCLG/PHG. Although EPA has adopted MCLGs for some individual THMs and HAAs (such as dibromochloromethane or dichloroacetic acid), there are no MCLs in effect for these individual constituents. Likewise, EPA has adopted standards for the cumulative byproduct groups but there are no MCLGs or PHGs established for the groups. In California, CDPH has adopted an MCL for both cumulative byproduct groups, but there are no associated PHGs. (Note: OEHHA published a draft PHG of 0.8 ppb for total trihalomethanes in August 2010 but it had not been finalized as of December 31, 2012).

However, individual MCLs and MCLGs have been adopted for other disinfection byproducts such as bromate and chlorite so they must be included in the report.

I. How should water utilities handle gross alpha and uranium?

When looking at the results of any radionuclide monitoring done in the 3-year period to be covered by the report, there are several things to keep in mind:

As indicated in C.1 of this Guidance, where averaging is done to determine compliance with MCLs, it should also be done in considering PHGs. This is important for radionuclides because compliance is often based on averaging.

Unlike most other constituents, laboratories doing radionuclides report some results that are LOWER than the state DLR. Title 22, 64442 (h)(3)(c) states: "If a sample result is LESS than the DLR in Table 64442, ZERO shall be used to calculate the annual average....." Also, it says for Gross Alpha: ".....1/2 of the DLR shall be used to calculate the annual average."

Where Gross Alpha analyses are used in lieu of analyzing for uranium, Radium 226 or 228, the procedure outlined in Title 22, 64442(f) should be followed. (Note: The 95% confidence limit is often reported by labs as MDA95.)

J. Do water utilities have to report detections of Hexavalent Chromium?

Water systems do NOT have to report anything on Hexavalent chromium because there is not an MCL. While there is an MCL and an MCLG for TOTAL chromium, systems will not have to report on it either since the MCLG (100 ppb) is much higher than the CA MCL (50 ppb).

V. Cost Estimates (new information for 2013!)

The most difficult aspect of the required report is estimating the cost of treatment. Agencies are urged to keep in mind that because of the advisory nature of the report, the non-enforceable aspect of PHGs and MCLGs, and the highly speculative applicability of technology to achieve "zero" levels, only very preliminary cost estimating is appropriate and necessary.

Remember that a cost estimate is only required for a constituent if you determine that it was "detected" above the PHG or MCLG. If the MCLG is zero and the result (after approximation, averaging, rounding) is less than the DLR, no cost estimate is needed. (Remember that many DLRs are LOWER than the PHG so "detection" above the DLR does not necessarily mean that it is above the PHG.)

The cost estimates should not be low estimates because that would give a mistaken impression that achieving "zero" levels would have a lower price tag when the amount of uncertainty and unknowns would be very high. Given the uncertainties, it might be appropriate to consider reporting a range of costs.

For the 2013 guidance, ACWA is providing an expansion of its previous cost information. ACWA's PHG Workgroup initiated a survey in late 2012 to collect treatment cost information from its members. In addition, the workgroup collected additional cost data from agencies with advanced treatment facilities using various treatment technologies to address different contaminants.

Attachment No. 3 to this guidance includes several tables which provide "ranges" of costs for installing and operating several treatment technologies. These data have been gathered from a variety of sources and represent estimates for different size systems, different sources, and different constituents targeted for reduction by the treatment.
Table 1 represents the results of a 2012 ACWA Survey of its member agencies.
Table 2 includes data from several agencies that was gathered separately from the survey.
Table 3 is treatment cost data from previous ACWA Guidance documents with the costs updated to 2012.
Table 4 is a summary of a 2011 report for the SWRCB on the cost of treatment to address nitrate.
Table 5 is a summary of a Water Research Foundation Project final report on cost of removal technologies for treatment of perchlorate.

The law specifies that the report should only "estimate the aggregate cost and the cost per customer of utilizing the technology" to reduce the level down to the PHG. There is no specification of what is to be estimated: Initial construction cost, annualized costs of construction and O&M, or another way of expressing cost. It is suggested that each utility may do it the way they report other costs. (EXAMPLES: 1. Initial Cost of Construction, including % increases for each of design, planning, CEQA, permitting, contingency, etc =$10 million or $1000 per customer plus an ongoing O&M Cost of $1 million or $100 per customer, forever; 2. Annualized Cost of Construction plus O&M = $2 million or $200 per customer.)

All possible technologies do not have to be evaluated for each constituent to compare costs. For example if GAC and RO are both possible treatment technologies to try to lower the level of a particular contaminant to the "zero" PHG/MCLG level, it is appropriate to specify and estimate costs for the technology that would likely be used, keeping in mind there are significant uncertainties based on a variety of factors. If the utility has multiple contaminants to address in the report, one technology (i.e., RO) may address them all, so a cost estimate for RO only could suffice.

General "order of magnitude" estimates are adequate. It is assumed that ALL costs including capital, land, construction, engineering, planning, environmental, contingency and O&M costs should be included but general assumptions can be made for most of these items.

If a system chooses to do its own cost estimating rather than use the costs in Attachment No. 3, it is recommended that generally available cost estimating guides be used such as from USEPA, WRF, AWWA, ASCE, or textbooks, manuals, journals.

The following is a list of excellent, relatively current references that might be used:

(1) Implementation of Arsenic Treatment Systems, Part 1. Process Selection; Awwa Research Foundation and U.S.E.P.A, Published by AwwaRF and AWWA, 2002,
(2) Implementation of Arsenic Treatment Systems, Part 2: Design Considerations, Operation and Maintenance, Awwa Research Foundation, Published by AwwaRF and AWWA, 2002,
(3) State-of-Science on Perchlorate Treatment Technologies, Final Report for Water Research Foundation project #4359, 2011,
(4) An Assessment of the State of Nitrate Treatment Alternatives, AWWA, June 2011, Chad Siedel and Craig Gorman, Jacobs Engineering Group, Inc.,
(5) Performance and Cost Analysis of Arsenic Treatment in California, October, 2009, JAWRA, UC Davis, Hilkert, Young, Green and Darby.

USEPA includes cost data in the Federal Register for each regulation when it is proposed or adopted. (NOTE: USEPA estimates generally do not consider state-specific concerns and some costs have been known to be underestimated in the past so costs should be increased appropriately and based on utility experience.) The experience of other utilities in your area that have installed treatment to meet MCLs or data reported in journals is valuable as well.

Utilities may also choose to have their engineering consultants prepare these very general cost estimates.

VI. Sample Hypothetical Report

Attachment No. 4 is an attempt to show what a PHG required report might look like for a "hypothetical" water system that serves more than 10,000 service connections and had one or more PHG/MCLG exceedances in the 3-year period ending December 31, 2012. It is NOT the only way the report might be done. The sample is based on these guidelines. If there appears to be a conflict between the sample and the guidelines, the guidelines should be followed.

If you have any questions about these guidelines or any of the attachments, feel free to contact Danielle Blacet, ACWA, at 916-441-4545.

REFERENCE 7

GLOSSARY OF WATER QUALITY TERMS

Best Available Technology (BAT)	The best available treatment techniques or other means available for achieving compliance with MCL.
Health Risks	Health risks with respect to Public Health Goals are based on long-term exposures to low levels of contaminants as would occur with drinking water, rather than high doses from a single or short-term exposure. The health risk category describes the type of health risk. Types of health risks include chronic toxicity (shortened life span, thyroid effects, liver effects, or kidney effects), acute toxicity (gastrointestinal effects), carcinogenicity (cancer), and reproductive toxicity.
Maximum Contaminant Level (MCL)	The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to PHGs as is economically and technologically feasible. Unless stated otherwise, the term MCL in this report refers to primary MCL.
Maximum Contaminant Level Goal (MCLG)	The level of a contaminant in drinking water below which there is no observable adverse effect to human health. MCLGs are similar to California PHGs, but not equivalent. MCLGs are non-enforceable goals established by the U.S. EPA based solely on health considerations for non-carcinogenic constituents. For all carcinogenic constituents (i.e. those chemicals known or suspected of causing cancer), U.S. EPA's policy is to set the MCLG at zero.
Numeric Health Risk	Describes the cancer risk. At the California MCL no cancer risk is calculated from chemicals considered "noncarcinogens." For carcinogens, PHGs are set at a concentration that does not pose any significant risk of cancer; this is usually a one-in-one-million excess cancer risk ($1x10^{-6}$).
One-in-one-million Risk Level	At the "one-in-one-million" risk level, not more than one person in a population of one million people drinking the water daily for 70 years would be expected to develop cancer as a result of exposure to that chemical in the water.
Parts per billion (ppb)	The weight of a chemical dissolved in a volume of water. Equivalent to micrograms per liter (ug/L).
Parts per million (ppm)	The weight of a chemical dissolved in a volume of water. Equivalent to milligrams per liter (mg/L).
Picocuries per liter (pCi/L)	A measure of radiation in a liter of water.
Public Health Goal (PHG)	The concentration of a contaminant in drinking water below which no known or anticipated adverse health effects will occur with an adequate margin of safety. This level is based on estimates that would pose a significant risk to individuals, including the most sensitive subpopulations, consuming water every day over an entire lifetime. PHGs are unique to California and are established by the Office of Environmental Health Hazard Assessment (OEHHA), a subdivision of the California Environmental Protection Agency.

List of Abbreviations and Acronyms

AL	Action Level
BAT	Best Available Treatment
CDHS	California Department of Health Services
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
OEHHA	Office of Environmental Health Hazard Assessment
PHG	Public Health Goal
SWP	State Water Project
TDS	Total Dissolved Solids
THM	Trihalomethanes
USEPA	United States Environmental Protection Agency

REFERENCE 5

Table 1
Reference: 2012 ACWA PHG Survey

COST ESTIMATES FOR TREATMENT TECHNOLOGIES
(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated Unit Cost 2012 ACWA Survey ($/1,000 gallons treated)
1	Ion Exchange	Coachella Valley WD, for GW, to reduce Arsenic concentrations. 2011 costs.	1.84
2	Ion Exchange	City of Riverside Public Utilities, for GW, for Perchlorate treatment.	0.89
3	Ion Exchange	Carollo Engineers, anonymous utility, 2012 costs for treating GW source for Nitrates. Design souce water concentration: 88 mg/L NO_3. Design finished water concentration: 45 mg/L NO_3. Does not include concentrate disposal or land cost.	0.67
4	Granular Activated Carbon	City of Riverside Public Utilities, GW sources, for TCE, DBCP (VOC, SOC) treatment.	0.45
5	Granular Activated Carbon	Carollo Engineers, anonymous utility, 2012 costs for treating SW source for TTHMs. Design souce water concentration: 0.135 mg/L. Design finished water concentration: 0.07 mg/L. Does not include concentrate disposal or land cost.	0.32
6	Granular Activated Carbon, Liquid Phase	LADWP, Liquid Phase GAC treatment at Tujunga Well field. Costs for treating 2 wells. Treament for 1,1 DCE (VOC). 2011-2012 costs.	1.36
7	Reverse Osmosis	Carollo Engineers, anonymous utility, 2012 costs for treating GW source for Nitrates. Design souce water concentration: 88 mg/L NO_3. Design finished water concentration: 45 mg/L NO_3. Does not include concentrate disposal or land cost.	0.72
8	Packed Tower Aeration	City of Monrovia, treatment to reduce TCE, PCE concentrations. 2011-12 costs.	0.39
9	Ozonation+ Chemical addition	SCVWD, STWTP treatment plant includes chemical addition + ozone generation costs to reduce THM/HAAs concentrations. 2009-2012 costs.	0.08
10	Ozonation+ Chemical addition	SCVWD, PWTP treatment plant includes chemical addition + ozone generation costs to reduce THM/HAAs concentrations, 2009-2012 costs.	0.18

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated Unit Cost 2012 ACWA Survey ($/1,000 gallons treated)
11	Coagulation/Filtration	Soquel WD, treatment to reduce manganese concentrations in GW. 2011 costs.	0.68
12	Coagulation/Filtration Optimization	San Diego WA, costs to reduce THM/Bromate, Turbidity concentrations, raw SW a blend of State Water Project water and Colorado River water, treated at Twin Oaks Valley WTP.	0.77
13	Blending (Well)	Rancho California WD, GW blending well, 1150 gpm, to reduce fluoride concentrations.	0.64
14	Blending (Wells)	Rancho California WD, GW blending wells, to reduce arsenic concentrations, 2012 costs.	0.52
15	Blending	Rancho California WD, using MWD water to blend with GW to reduce arsenic concentrations. 2012 costs.	0.62
16	Corrosion Inhibition	Atascadero Mutual WC, corrosion inhibitor addition to control aggressive water. 2011 costs.	0.08

Table 2
Reference: Other Agencies

COST ESTIMATES FOR TREATMENT TECHNOLOGIES
(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated Unit Cost 2012 Other References ($/1,000 gallons treated)
1	Reduction - Coagulation-Filtration	Reference: February 28, 2013, Final Report Chromium Removal Research, City of Glendale, CA. 100-2000 gpm. Reduce Hexavalent Chromium to 1 ppb.	$1.47 - $9.23
2	IX - Weak Base Anion Resin	Reference: February 28, 2013, Final Report Chromium Removal Research, City of Glendale, CA. 100-2000 gpm. Reduce Hexavalent Chromium to 1 ppb.	$1.50 - $6.29
3	IX	Golden State Water Co., IX w/disposable resin, 1 MGD, Perchlorate removal, built in 2010.	$0.46
4	IX	Golden State Water Co., IX w/disposable resin, 1000 gpm, perchlorate removal (Proposed; O&M estimated).	$1.00
5	IX	Golden State Water Co., IX with brine regeneration, 500 gpm for Selenium removal, built in 2007.	$6.57
6	GFO/Adsorption	Golden State Water Co., Granular Ferric Oxide Resin, Arsenic removal, 600 gpm, 2 facilities, built in 2006.	$1.72 -$1.84
7	RO	Reference: Inland Empire Utilities Agency : Chino Basin Desalter. RO cost to reduce 800 ppm TDS, 150 ppm Nitrate (as NO3); approx. 7 mgd.	$2.25
8	IX	Reference: Inland Empire Utilities Agency : Chino Basin Desalter. IX cost to reduce 150 ppm Nitrate (as NO3); approx. 2.6 mgd.	$1.25
9	Packed Tower Aeration	Reference: Inland Empire Utilities Agency : Chino Basin Desalter. PTA-VOC air stripping, typical treated flow of approx. 1.6 mgd.	$0.38

10	IX	Reference: West Valley WD Report, for Water Recycling Funding Program, for 2.88 mgd treatment facility. IX to remove Perchlorate, Perchlorate levels 6-10 ppb. 2008 costs.	$0.52 - $0.74
11	Coagulation Filtration	Reference: West Valley WD, includes capital, O&M costs for 2.88 mgd treatment facility- Layne Christensen packaged coagulation Arsenic removal system. 2009-2012 costs.	$0.34
12	FBR	Reference: West Valley WD/Envirogen design data for the O&M + actual capitol costs, 2.88 mgd fluidized bed reactor (FBR) treatment system, Perchlorate and Nitrate removal, followed by multimedia filtration & chlorination, 2012. NOTE: The capitol cost for the treatment facility for the first 2,000 gpm is $23 million annualized over 20 years with ability to expand to 4,000 gpm with minimal costs in the future. $17 million funded through state and federal grants with the remainder funded by WVWD and the City of Rialto.	$1.55 - $1.63

Table 3
Reference: 2010 ACWA Cost of Treatment Table, Costs Revised for 2012

COST ESTIMATES FOR TREATMENT TECHNOLOGIES
(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated 2012* Unit Cost ($/1,000 gallons treated)
1	Granular Activated Carbon	Reference: Malcolm Pirnie estimate for California Urban Water Agencies, large surface water treatment plants treating water from the State Water Project to meet Stage 2 D/DBP and bromate regulation, 1998	0.53-1.00
2	Granular Activated Carbon	Reference: Carollo Engineers, estimate for VOC treatment (PCE), 95% removal of PCE, Oct. 1994,1900 gpm design capacity	0.24
3	Granular Activated Carbon	Reference: Carollo Engineers, est. for a large No. Calif. surf. water treatment plant (90 mgd capacity) treating water from the State Water Project, to reduce THM precursors, ENR construction cost index = 6262 (San Francisco area) - 1992	1.16
4	Granular Activated Carbon	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility for VOC and SOC removal by GAC, 1990	0.45-0.66
5	Granular Activated Carbon	Reference: Southern California Water Co. - actual data for "rented" GAC to remove VOCs (1,1-DCE), 1.5 mgd capacity facility, 1998	2.08
6	Granular Activated Carbon	Reference: Southern California Water Co. - actual data for permanent GAC to remove VOCs (TCE), 2.16 mgd plant capacity, 1998	1.35
7	Reverse Osmosis	Reference: Malcolm Pirnie estimate for California Urban Water Agencies, large surface water treatment plants treating water from the State Water Project to meet Stage 2 D/DBP and bromate regulation, 1998	1.56-2.99
8	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 1.0 mgd plant operated at 40% of design flow, high brine line cost, May 1991	3.69
9	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 1.0 mgd plant operated at 100% of design flow, high brine line cost, May 1991	2.27
10	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 10.0 mgd plant operated at 40% of design flow, high brine line cost, May 1991	2.46
11	Reverse Osmosis	Reference: Boyle Engineering, RO cost to reduce 1000 ppm TDS in brackish groundwater in So. Calif., 10.0 mgd plant operated at 100% of design flow, high brine line cost, May 1991	1.90
12	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 1.0 mgd plant operated at 40% of design capacity, Oct. 1991	6.17

COST ESTIMATES FOR TREATMENT TECHNOLOGIES

(INCLUDES ANNUALIZED CAPITAL AND O&M COSTS)

No.	Treatment Technology	Source of Information	Estimated 2012* Unit Cost ($/1,000 gallons treated)
13	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 1.0 mgd plant operated at 100% of design capacity, Oct. 1991	3.64
14	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 10.0 mgd plant operated at 40% of design capacity, Oct. 1991	2.73
15	Reverse Osmosis	Reference: Arsenic Removal Study, City of Scottsdale, AZ - CH2M Hill, for a 10.0 mgd plant operated at 100% of design capacity, Oct. 1991	1.69
16	Reverse Osmosis	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility with RO to remove nitrate, 1990	1.70-2.99
17	Packed Tower Aeration	Reference: Analysis of Costs for Radon Removal... (AWWARF publication), Kennedy/Jenks, for a 1.4 mgd facility operating at 40% of design capacity, Oct. 1991	0.98
18	Packed Tower Aeration	Reference: Analysis of Costs for Radon Removal... (AWWARF publication), Kennedy/Jenks, for a 14.0 mgd facility operating at 40% of design capacity, Oct. 1991	0.52
19	Packed Tower Aeration	Reference: Carollo Engineers, estimate for VOC treatment (PCE) by packed tower aeration, without off-gas treatment, O&M costs based on operation during 329 days/year at 10% downtime, 16 hr/day air stripping operation, 1900 gpm design capacity, Oct. 1994	0.26
20	Packed Tower Aeration	Reference: Carollo Engineers, for PCE treatment by Ecolo-Flo Enviro-Tower air stripping, without off-gas treatment, O&M costs based on operation during 329 days/year at 10% downtime, 16 hr/day air stripping operation, 1900 gpm design capacity, Oct. 1994	0.27
21	Packed Tower Aeration	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility - packed tower aeration for VOC and radon removal, 1990	0.42-0.69
22	Advanced Oxidation Processes	Reference: Carollo Engineers, estimate for VOC treatment (PCE) by UV Light, Ozone, Hydrogen Peroxide, O&M costs based on operation during 329 days/year at 10% downtime, 24 hr/day AOP operation, 1900 gpm capacity, Oct. 1994	0.51
23	Ozonation	Reference: Malcolm Pirnie estimate for CUWA, large surface water treatment plants using ozone to treat water from the State Water Project to meet Stage 2 D/DBP and bromate regulation, *Cryptosporidium* inactivation requirements,1998	0.12-0.24
24	Ion Exchange	Reference: CH2M Hill study on San Gabriel Basin, for 135 mgd central treatment facility - ion exchange to remove nitrate, 1990	0.57-0.74

Note: *Costs were adjusted from date of original estimates to present, where appropriate, using Engineering News Record (ENR) building costs index (20-city average) from Dec 2012.

REFERENCE 6

TRIENNUAL PUBLIC HEALTH GOAL (PHG) EXCEEDENCES : 2010-2012

DATE	SUBSTANCE	UNITS	MCL	PHG (MCLG)	RANGE of DETECTION	WATER SOURCE	SOURCES OF CONTAMINANT IN DRINKING WATER	HEALTH EFFECTS
2010	**Total Coliform Bacteria**	**MPN/ 100 mL**	**5%**	**(0)**	Distribution system-wide highest monthly value = **1.5%**	Distribution System	Naturally present in the environment.	Indicator of possible presence of potentially-harmful bacteria.
2010	**Arsenic**	**ppb**	**10**	**0.004**	**nd - 8.3**	Ground Water Wells 2, 3, 6, 7, 8, 9, 13,14,15, & 16; VWTP Treated Water	Naturally occurring in environment.	Some people who drink water containing arsenic in excess of the MCL over many years may experience skin damage or circulatory problems and may have an increased risk of cancer.
2010	**Bromate**	**ppb**	**10**	**0.1**	**nd - 4.3**	North Bay Regional Treated water	Drinking water disinfectant added for treatment.	Some people who drink water containing bromate in excess of the MCL over many years may have an increased risk of getting cancer.
2010	**Nickel**	**ug/L**	**100**	**12**	**nd - 16**	North Bay Aqueduct	Erosion of natural deposits; discharge from metal factories	Some people who drink water containing nickel in excess of the MCL over many years may experience liver and heart effects.
2011	**Arsenic**	**ug/L**	**10**	**0.004**	**nd - 9.9**	Ground Water Wells 2, 3, 6, 7, 8, 9, 13,14,15, & 16; VWTP Treated Water	Naturally occurring in environment.	Some people who drink water containing arsenic in excess of the MCL over many years may experience skin damage or circulatory problems and may have an increased risk of cancer.
2011	**Bromate**	**ppb**	**10**	**0.1**	**nd - 3.5**	North Bay Regional Treated water	Drinking water disinfectant added for treatment.	Some people who drink water containing bromate in excess of the MCL over many years may have an increased risk of getting cancer.
2011	**Lead**	**ug/L**	**15**	**0.2**	**nd - 0.7**	Ground Water Wells 3 & 9.	Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits	Infants and children who drink water containing lead in excess of the action level may experience delays in their physical or mental development. Children may show slight deficits in attention span and learning abilities. Adults who drink this water over many years may develop kidney problems or high blood
2011	**Gross Beta Activity**	**pCi/L**	**50**	**(0)**	**nd - 5.0**	Ground Water Wells 3, 8, 9 & 14	Decay of natural and man-made deposits	Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer.
2011	**Uranium (pCi/L)**	**pCi/L**	**20**	**0.4**	**1.1 - 3.2**	Ground Water Wells 2, 3, 6, 7, 8, 9, 13,14,15, & 16	Erosion of natural deposits	Some people who drink water containing uranium in excess of the MCL over many years may have kidney problems or an increased risk of getting cancer.
2012	**Arsenic**	**ug/L**	**10**	**0.004**	**nd - 8.5**	Ground Water Well 16; VWTP Treated Water	Naturally occurring in the environment.	Some people who drink water containing arsenic in excess of the MCL over many years may experience skin damage or circulatory problems and may have an increased risk of cancer.

REFERENCE 6

REFERENCE 7

GLOSSARY OF WATER QUALITY TERMS

Best Available Technology (BAT)	The best available treatment techniques or other means available for achieving compliance with MCL.
Health Risks	Health risks with respect to Public Health Goals are based on long-term exposures to low levels of contaminants as would occur with drinking water, rather than high doses from a single or short-term exposure. The health risk category describes the type of health risk. Types of health risks include chronic toxicity (shortened life span, thyroid effects, liver effects, or kidney effects), acute toxicity (gastrointestinal effects), carcinogenicity (cancer), and reproductive toxicity.
Maximum Contaminant Level (MCL)	The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to PHGs as is economically and technologically feasible. Unless stated otherwise, the term MCL in this report refers to primary MCL.
Maximum Contaminant Level Goal (MCLG)	The level of a contaminant in drinking water below which there is no observable adverse effect to human health. MCLGs are similar to California PHGs, but not equivalent. MCLGs are non-enforceable goals established by the U.S. EPA based solely on health considerations for non-carcinogenic constituents. For all carcinogenic constituents (i.e. those chemicals known or suspected of causing cancer), U.S. EPA's policy is to set the MCLG at zero.
Numeric Health Risk	Describes the cancer risk. At the California MCL no cancer risk is calculated from chemicals considered "noncarcinogens." For carcinogens, PHGs are set at a concentration that does not pose any significant risk of cancer; this is usually a one-in-one-million excess cancer risk ($1x10^{-6}$).
One-in-one-million Risk Level	At the "one-in-one-million" risk level, not more than one person in a population of one million people drinking the water daily for 70 years would be expected to develop cancer as a result of exposure to that chemical in the water.
Parts per billion (ppb)	The weight of a chemical dissolved in a volume of water. Equivalent to micrograms per liter (ug/L).
Parts per million (ppm)	The weight of a chemical dissolved in a volume of water. Equivalent to milligrams per liter (mg/L).
Picocuries per liter (pCi/L)	A measure of radiation in a liter of water.
Public Health Goal (PHG)	The concentration of a contaminant in drinking water below which no known or anticipated adverse health effects will occur with an adequate margin of safety. This level is based on estimates that would pose a significant risk to individuals, including the most sensitive subpopulations, consuming water every day over an entire lifetime. PHGs are unique to California and are established by the Office of Environmental Health Hazard Assessment (OEHHA), a subdivision of the California Environmental Protection Agency.

List of Abbreviations and Acronyms

AL	Action Level
BAT	Best Available Treatment
CDHS	California Department of Health Services
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
OEHHA	Office of Environmental Health Hazard Assessment
PHG	Public Health Goal
SWP	State Water Project
TDS	Total Dissolved Solids
THM	Trihalomethanes
USEPA	United States Environmental Protection Agency